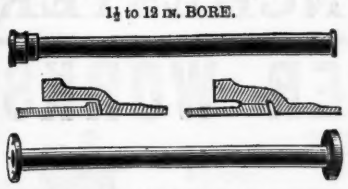
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1694.] LONDON, OCTOBER 29, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bonlea Foundry,

SOUTH STOCKTON-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

Telegrams: "BONLEA, STOCKTON-ON-TEES."

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

"BEAR CREEK" CANNEL.

LOG MOUNTAIN COAL, COKE, AND TIMBER CO., PINEVILLE, KENTUCKY, U.S.A.

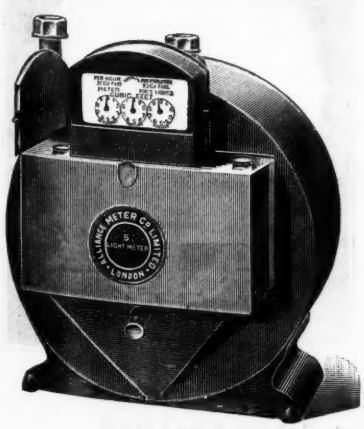
Cable Address: "Hull, Pineville."

LONDON AGENTS

W. J. WILSON & CO., Suffolk House, Cannon St., E.C.

THE ALLIANCE METER COMPANY, LTD.

WET & DRY GAS-METERS.



FREE SAMPLES

for Inspection and Test sent Carriage Paid.

These Meters, manufactured at the Company's Factories in the United States of America, are of superior quality and workmanship, and contain many valuable Improvements, which render them less liable to derangement than any other Meters.

They will not allow the smallest quantity of Gas to pass without being registered, and are warranted to register correctly, and not to vary with different pressures.

THE ALLIANCE METER COMPANY, Ltd., 9, London Street, London, E.C.

CASH PREPAYMENT METERS.

THE "POSITIVE" PREPAYMENT SLOT METER.

Noted for Strength and Simplicity of Construction.

Used by many Corporations and Gas Companies.

Material and Workmanship of the best.

Prices and full Particulars on application.

SAWER & PURVES, MANCHESTER.

PUMPS FOR GAS & WATER WORKS.

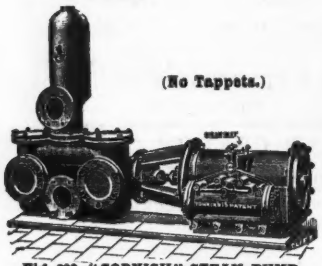
FIRST AWARDS EVERYWHERE.

TELEGRAMS: "EVANS WOLVERHAMPTON."

LATEST HIGHEST AWARD, TASMANIA, 1895.
"Special" First-Class Certificate.

APPLY FOR CATALOGUE NO. 8.

TRADE MARK.



(No Tappets.)

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

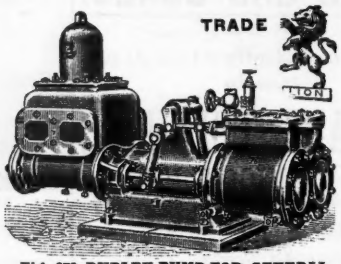


Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

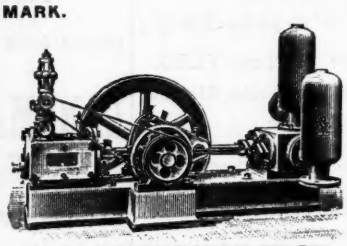


Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

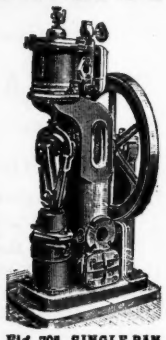
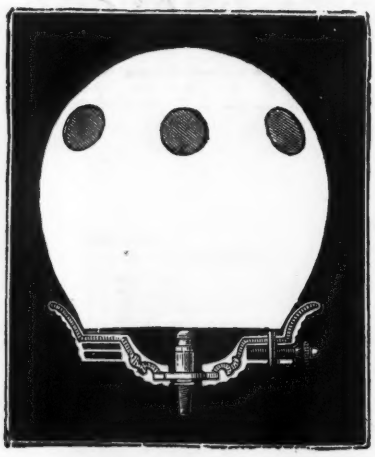


Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

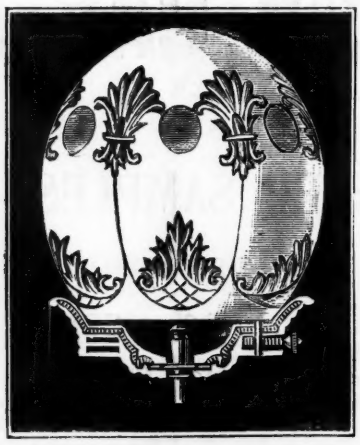
JOSEPH EVANS & SONS, Hydraulic Engineers,

WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

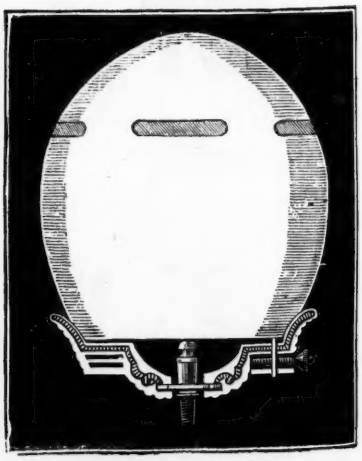
THE UNIQUE GLOBE.



No. 1085.



No. 31,065.



No. 1318.

We supply these Globes in many Varieties and Decorations, Flint, Coloured, and Opal in

MANOGRAPHY, ETCHED, OR PAINTED.

Large Stock, in original cases or loose, always ready. Our quality Opal is the best and strongest.

CATALOGUE AND PRICES ON APPLICATION (to the Trade only) TO

FALK, STADELMANN, & Co.

VERITAS LAMP WORKS, Limited,

83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

Telegrams: "GASOMETER GLASGOW."

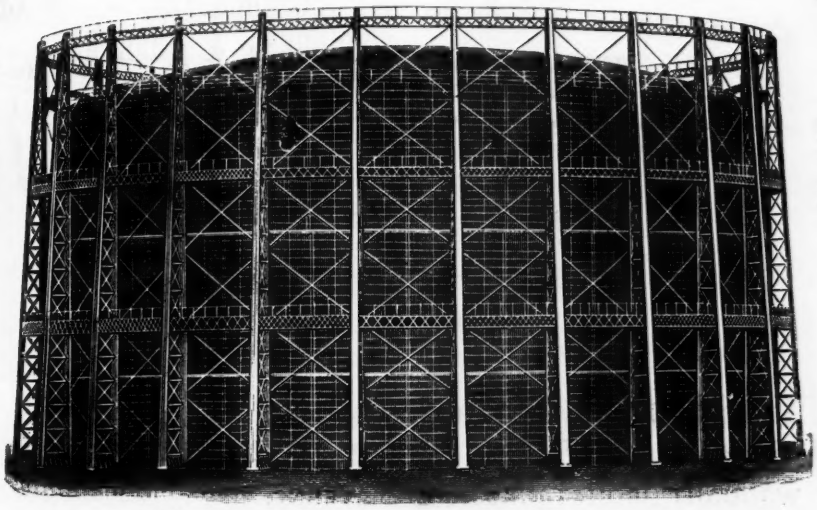
GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

W. H. ALLEN & CO.,

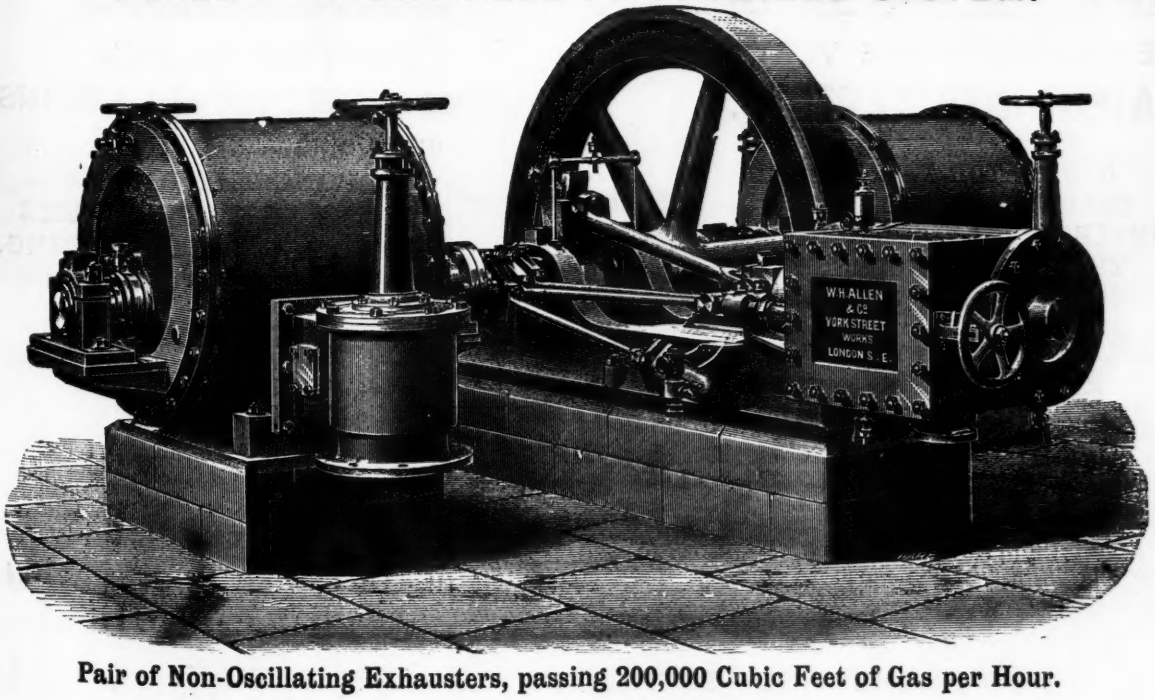
YORK STREET WORKS, LAMBETH, LONDON, S.E.,

And of QUEEN'S ENGINEERING WORKS, BEDFORD,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

GAS COAL.

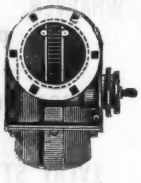
BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED,

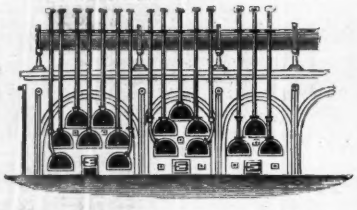
THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

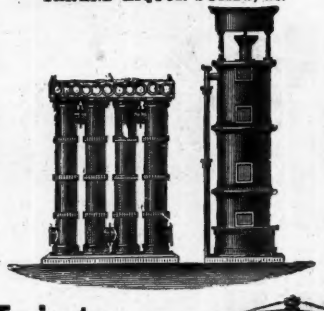
SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS of all sizes.
GASHOLDERS,
AND
Gasholder Tanks.



CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates,
Tools, &c.

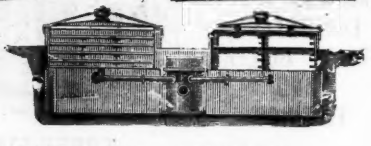


WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.



PATENT
CENTRE-VALVES
for working Purifiers,
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

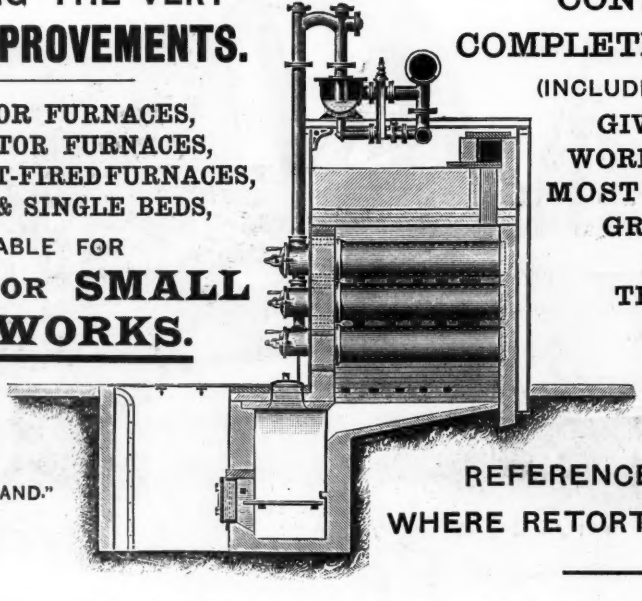
R. DEMPSTER & SONS, LD.

ELLAND, YORKS.

RETORT-SETTINGS

EMBODYING THE VERY
LATEST IMPROVEMENTS.

GENERATOR FURNACES,
REGENERATOR FURNACES,
SIMPLE DIRECT-FIRED FURNACES,
THROUGH & SINGLE BEDS,
SUITABLE FOR
LARGE OR SMALL
GAS-WORKS.



CONTRACTS FOR
COMPLETE INSTALLATIONS
(INCLUDING ALL FITTINGS),
GIVING THE HIGHEST
WORKING RESULTS, THE
MOST PERFECT HEATING.
GREATLY INCREASED
DURABILITY,
THE LOWEST FUEL
CONSUMPTION.

TELEGRAMS:
"DEMPSTER, ELLAND."

REFERENCE TO ENGINEERS
WHERE RETORTS ARE IN OPERATION.

PLANS AND ESTIMATES ON APPLICATION.

BRAY'S PATENT "ENAMEL"

GAS-BURNERS

BRAY'S

"SPECIAL" & "ADJUSTABLE" BURNERS

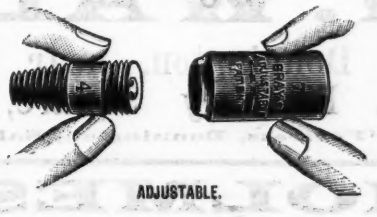
Are the Best for General Use, and will, at their

REDUCED PRICE,

Save their Cost in Gas alone in Forty Hours' use.

SCREWED FOR

GLOBE HOLDERS



SCREWED FOR

GLOBE HOLDERS

The "Adjustables" are specially adapted for use with Penny-in-the-Slot Meters, for which purpose large quantities have been sold.

THE "CODAC" ECONOMISER.

Ordinary Regulator Burner with "Codac" Top on.

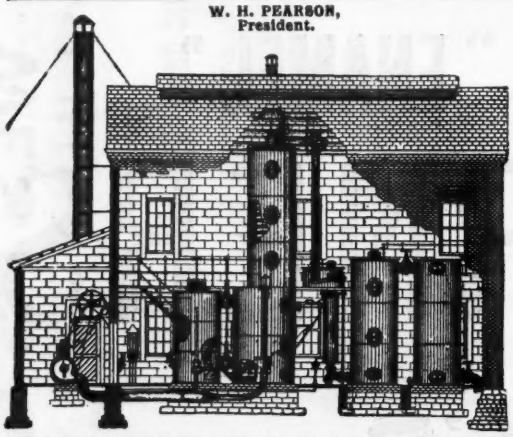
A cheap adaptation of Bray's "ADJUSTABLE" BURNER, not so efficient, but acceptable for some purposes. The top part only is required, and is made merely to slip on to our ordinary Regulator Burners, which are in use throughout the world. Made in Union Jets and Batswings.

Ordinary Regulator Burner with "Codac" Top on.

SEND FOR PRICE LIST AND CATALOGUE.

GEO. BRAY & Co., Gas-Lighting Engineers, LEEDS.

W. H. PEARSON, President.
J. T. WESTCOTT, M.E., General Manager & Treasurer.
L. L. MERRIFIELD, Chief Engineer.



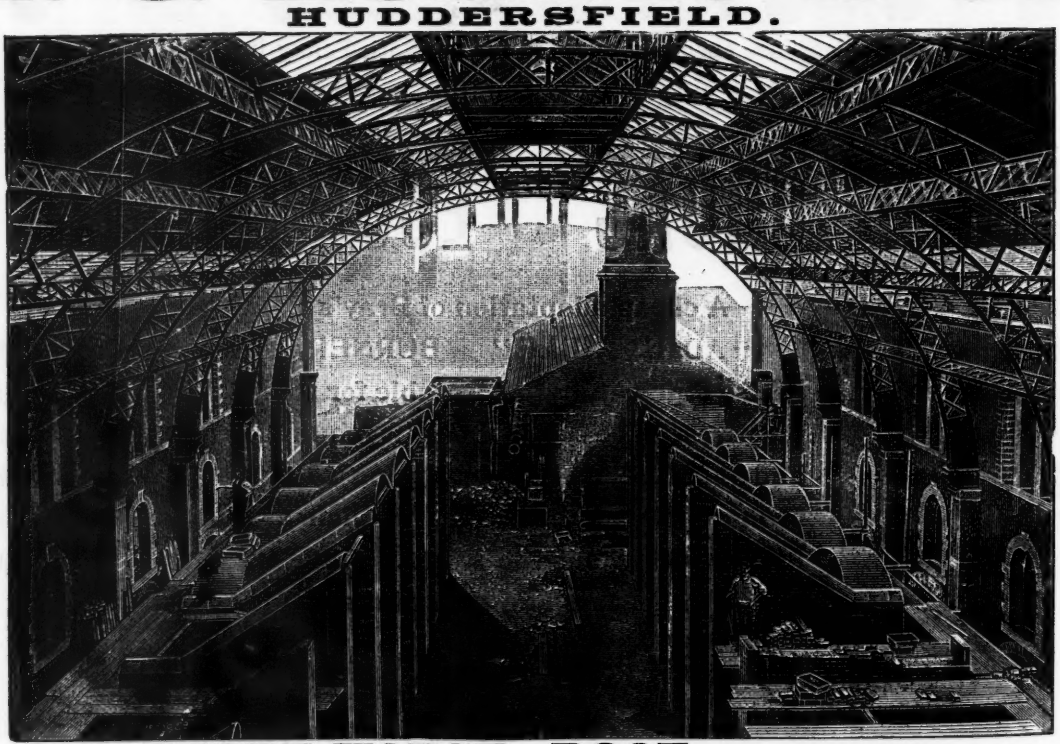
LOWE WATER-GAS APPARATUS, Merrifield-Westcott-Pearson Setting.

THE
Economical Gas Apparatus Construction Co., Ld.
ENGINEERS AND BUILDERS
OF THE
IMPROVED LOWE
CARBURETTED WATER-GAS PLANT
Designed to give the greatest efficiency when using any kind of Oil, Gas-House Coke, Oven Coke, or Anthracite Coal.
MR. WESTCOTT MAY BE CONSULTED AT THE
LONDON OFFICES: SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.
Canada and U.S.A. Offices: TORONTO.
Telegraphic Address: "CARBURETED, LONDON."

GASHOLDERS
OF ALL SIZES.
C. & W. WALKER,
Midland Iron-Works, Donnington, near Newport, Shropshire;
and 10, Finsbury Square, London.
Telegraphic Addresses: "Fortress, Donnington, Salop;" "Fortress, London."

W. C. HOLMES & CO.,
HUDDERSFIELD.

Makers of Retort Ironwork, Condensers, Patent Rotary Scrubber-Washers, Purifiers.



Gasholders of all sizes, and Gas Plant and Structural Ironwork of every description.

RETORT-HOUSE ROOF (as finished),
Span 89 ft. 6 in. by 360 ft. long.
Made and Erected to designs by Mr. W. R. HERRING,
BY
W. C. HOLMES & CO., Contractors,
Telegrams: "HOLMES, HUDDERSFIELD." | Works: HUDDERSFIELD. | London Office: 80, CANNON ST., E.C. Telegrams: "IGNITOR."

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

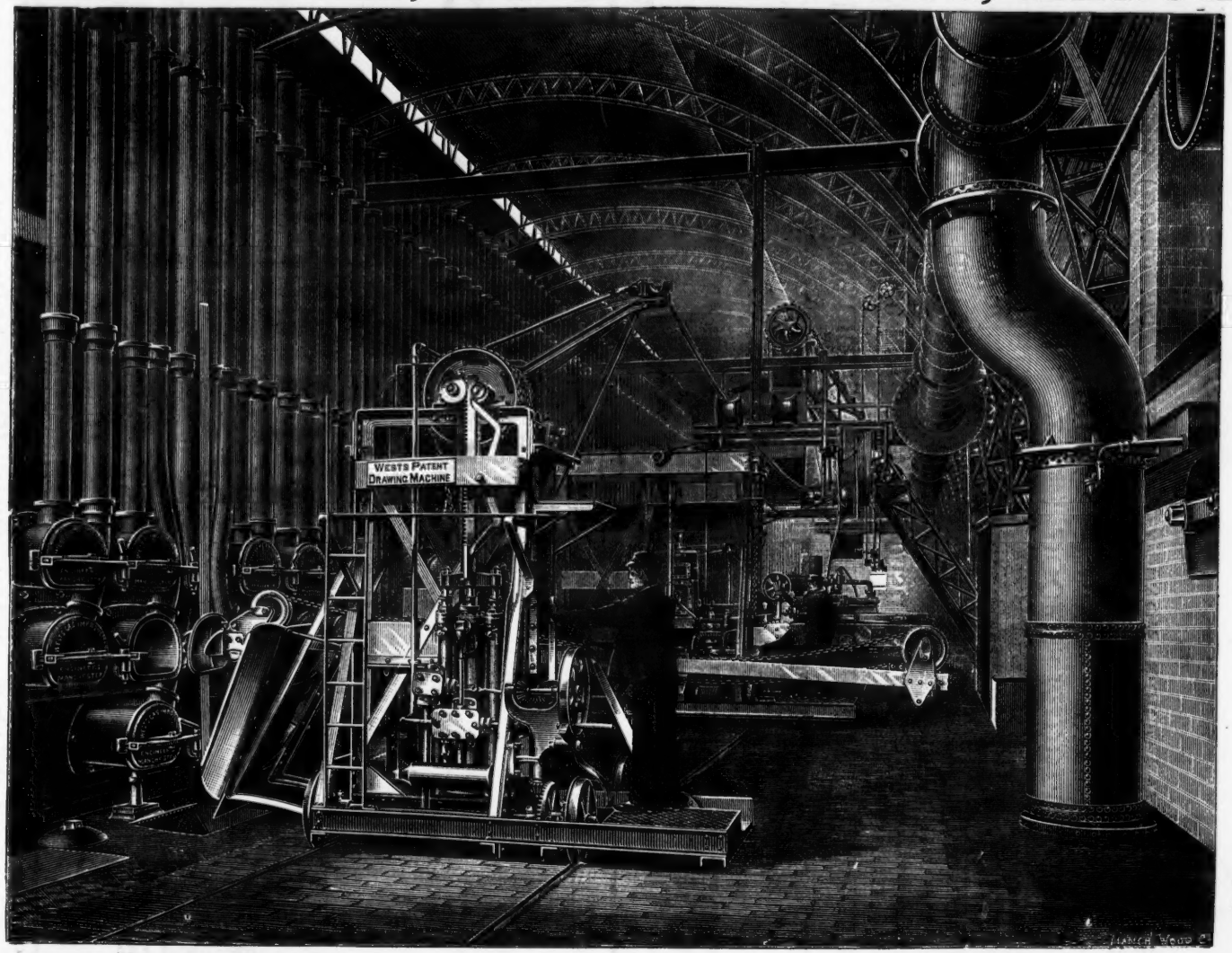
ALBION IRON-WORKS, MILES PLATTING, MANCHESTER.

AND

104, Queen Victoria St.,

LONDON, E.C.

WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



AND

104, Queen Victoria St.,

LONDON, E.C.

OVER 560,000 LINEAL FEET OF RETORTS DAILY ARE CHARGED AND DRAWN BY WEST'S MACHINES.

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

Gasholders of all sizes, and Gas Plant and Structural Ironwork of every description.

ALL TELESCOPE HOLDERS SHOULD BE FITTED

WITH

CUTLER'S PATENT FREEZING PREVENTER

WHICH HAS BEEN FITTED TO MANY OF THE LARGEST GASHOLDERS IN LONDON AND THE PROVINCES, AND IN AUSTRIA, GERMANY, DENMARK, AND THE UNITED STATES.

Full Particulars and Prices from S. CUTLER & SONS, MILLWALL, LONDON.

THE WIRRAL ENGINEERING COMPANY, LTD.

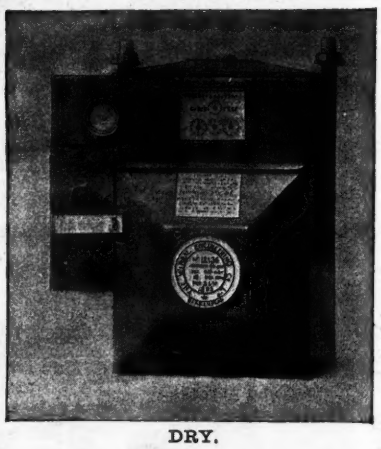
Patent New Prepayment Meters.

WET.

THE "PERFECT" AUTOMATIC.

Simple! Positive!! Accurate!!!

The only Prepayment Meter with no Springs, Counter-Balance Weights, or Frictional Gearing to get out of order.



DRY.

Particulars on Application to the COMPANY, 76, Hamilton Street, BIRKENHEAD.

WIRE-ROPE HOLDERS.

Engineers and others visiting any of the below-mentioned places should not fail to examine these most interesting examples of Engineering, illustrating modern practice in Gasholder Construction :—

NOTTINGHAM (Eastcroft Works, Four Holders), MANCHESTER (Rochdale Road Works, One Holder, Gaythorn, Three Holders), HASLINGDEN, BIRKENHEAD, BARROW-IN-FURNESS, SLIGO, DARLINGTON, TYNE DOCKS, MIDDLESBROUGH, NEWBURN STEEL-WORKS, SELBY, SOUTHBOROUGH, ST. AUSTELL (Cornwall), MILAN (Italy), ATHENS (Greece), HORSENS (Denmark), BATHURST (New South Wales), CAPE TOWN (South Africa).

For Particulars, apply to Makers and Inventors—

ASHMORE, BENSON, PEASE, & CO., LIMITED,

Gas-Works Contractors,

STOCKTON-ON-TEES.

IMPROVEMENTS IN STREET LIGHTING.
HIGHEST EFFICIENCY WITH GREATEST ECONOMY.

LIGHTING AUTHORITIES, GAS ENGINEERS, & GAS MANAGERS

Are invited to inspect the

INCANDESCENT GAS-LIGHT

Which has now been successfully adapted to the purposes of

STREET LIGHTING,

THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.

Two forms of Burners are specially recommended for Street Lighting:—

THE "C" BURNER,
Giving a light of **60** Candles, with a Consumption of **3½** Cubic Feet of Gas an hour.

THE "S" BURNER,
Giving a Light of **25** to **30** Candles, with a Consumption of **2¼** Feet of Gas an hour.

This System of Lighting meets the Requirements of all the Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting, without any increase of expenditure.

THE INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—

(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours.
The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.
After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4¾d., and a large increase in the Illumination of the Street.
(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.
The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns fitted with flat-flame burners.

The net result therefore appears to be that, by the use of the Incandescent Gas-Light System, the saving effected is over 50s. per annum per lamp, and at the same time more than double the light is obtained. It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

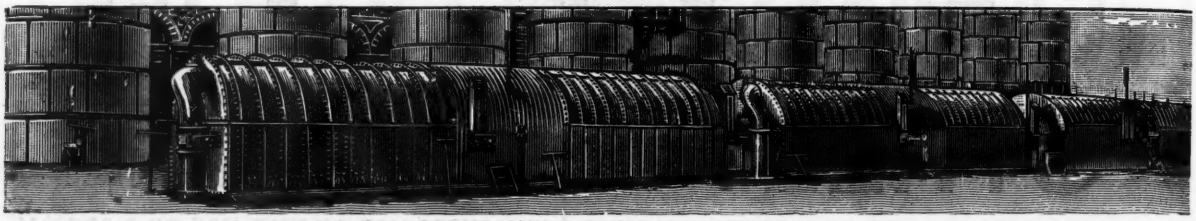
For further Particulars, apply to

THE INCANDESCENT GAS-LIGHT COMPANY, LTD.,
PALMER STREET WESTMINSTER, LONDON, S.W.

KIRKHAM, HULETT, & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBER

☛ **502** of these Machines (capable of dealing with **488,800,000** cubic feet of Gas daily) in use and in course of construction, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

MARSHALL'S PATENT BATTERY CONDENSER & SCRUBBER.

This apparatus being made in sections, the capacity can be easily and cheaply made proportionate to increased make of Gas. Other advantages are: Large and effective cooling area on small ground space, slow speed, no repairs required, high strength liquor obtained, &c. Three of these Condensers now in course of construction, and can be inspected.

MARSHALL'S PATENT TAR-EXTRACTOR.

Extracts practically all the Tar without choking up, and gives minimum back-pressure.

These Machines are in use at Ilford, Antwerp, Copenhagen, &c.

3 & 4, Palace Chambers, Bridge Street, Westminster, S.W.

R. LAIDLAW & SON

ENGINEERS & IRONFOUNDERS.

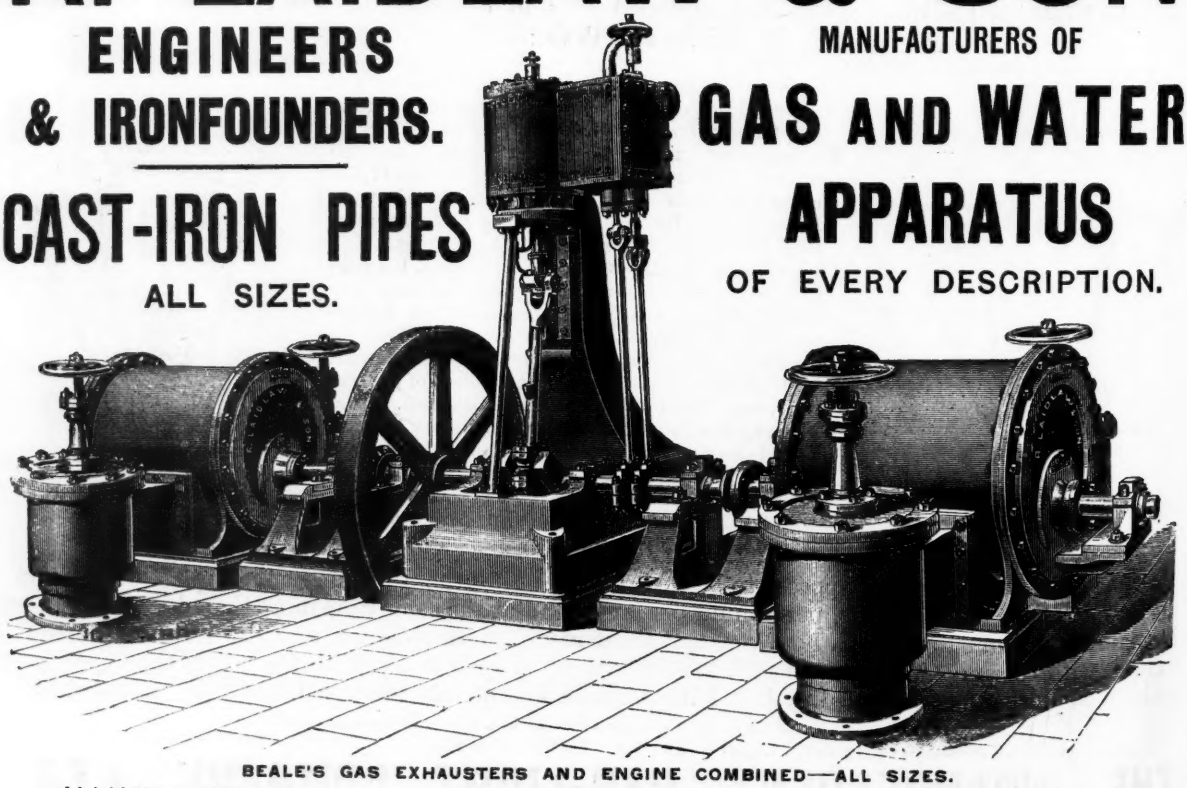
MANUFACTURERS OF

GAS AND WATER APPARATUS

OF EVERY DESCRIPTION.

CAST-IRON PIPES

ALL SIZES.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED—ALL SIZES.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

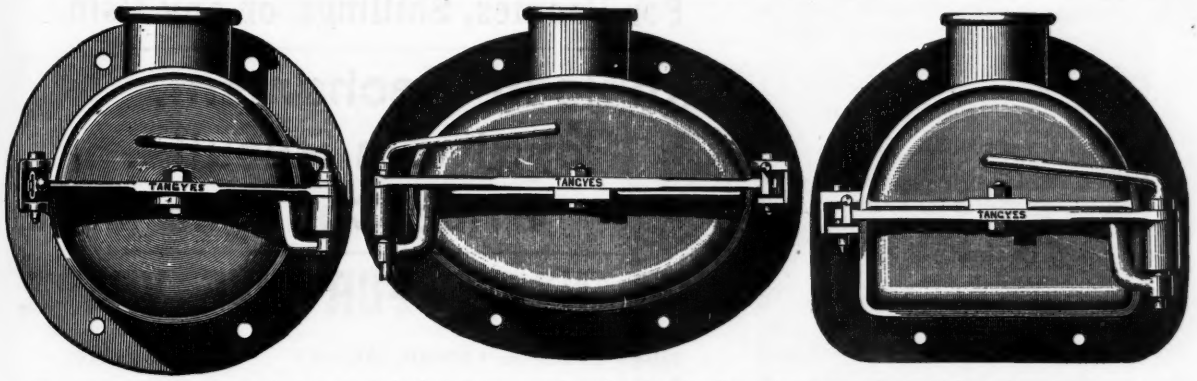
TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM;

AND AT

LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, JOHANNESBURG, BILBAO, ROTTERDAM, & BELFAST.

MORTON'S SELF-SEALING RETORT-LID,

With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.



These Retort Lids and Fastenings are made in three forms, round, oval, and ⌂ (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these Lids are recommended to make their selection, in order to avoid cost of pattern-making, delays, &c., &c.

QUOTATIONS WILL BE GIVEN ON RECEIPT OF PARTICULARS OF REQUIREMENTS.

LIST OF PATTERNS ON APPLICATION.

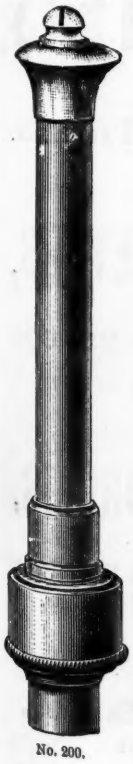
Telegrams: "TANGYES, BIRMINGHAM." No. 90 E.

GEORGE ORME & CO.,

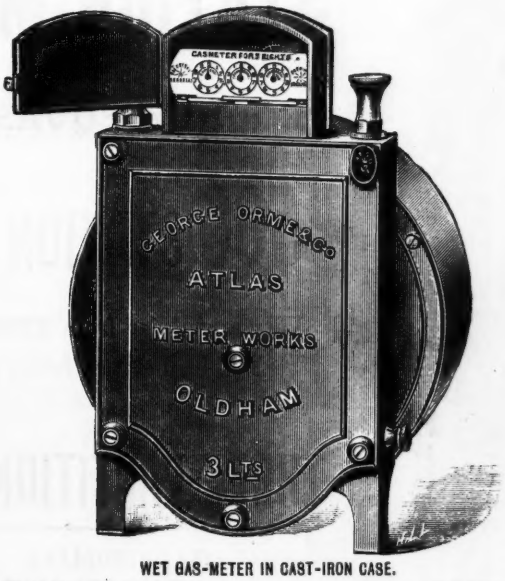
MANUFACTURERS OF IMPROVED WET AND DRY GAS-METERS,

ATLAS METER WORKS, OLDHAM.

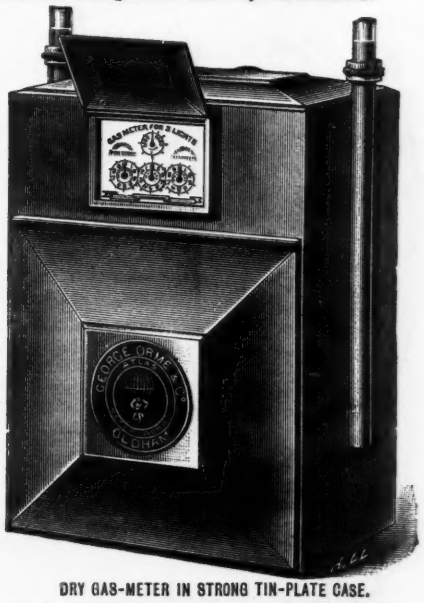
Telegraphic Address: "ORME OLDHAM." National Telephone No. 93, OLDHAM.



No. 200.



WET GAS-METER IN CAST-IRON CASE.



DRY GAS-METER IN STRONG TIN-PLATE CASE.

ORME'S GAS REGULATOR FOR STREET LAMPS.

AS ILLUSTRATION NO. 200.

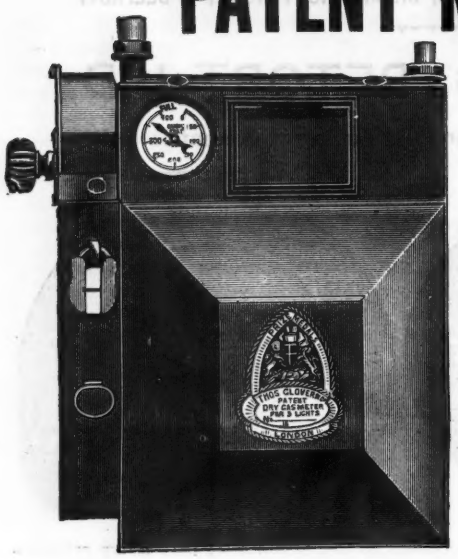
Adopted by the leading London and Provincial Gas Companies. More than 150,000 now in use.

Main Gas Cocks, Pressure-Gauges, & all descriptions of Gas, Water, & Steam Fittings in stock.

Illustrated Price Lists and full Particulars on application.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

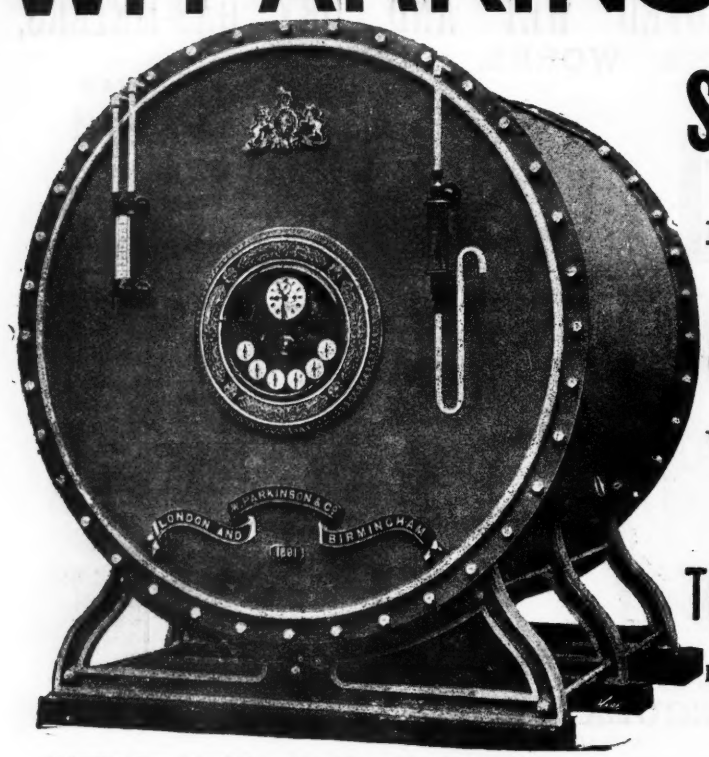
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & Co



STATION METERS

IN

ROUND or SQUARE TANKS.

500 STATION METERS,

Varying in size from **1200** to **250,000** cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Popularization of Good Investments 865
The Midland Meeting 865
Permanence for Gas and Water Stocks 866
Concerning the Retiring Gas-Meter 866
How They Pay the "Living Wage" in New York 866
The State of the Coal Mining Population 867

WATER AND SANITARY AFFAIRS—

The Position of the London Water Question—
The County Council and their Policy 868
An Important Memorandum on the Purchase Question . . . 868

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 869
Electric Lighting Memoranda 869
Upon Sundry Labour Questions 870
An Architect and Surveyor's Handbook of Gas-Fitting 871
Mineral Oils 871
Rural Water Suppy 871

NOTES:—

The Cooling Effect of Ribbed Condenser Pipes 872
The Laval Steam-Turbine 872
The Atomic Weight of Carbon 872
Novel Construction of a Masonry Dam 872
A New Industrial Pyrometer 872

COMMUNICATED ARTICLES:—

Notes on Current Topics. By "Veritas" 873
On the Flow of Gas in Pipes. By Arthur H. Crump 874
Phosphoretted Hydrogen in Acetylene Prepared from Calcium Carbide. By G. E. Brown, A.I.C. 874

TECHNICAL RECORD:—

Midland Association of Gas Managers—Meeting in Birmingham—
General Business 874
Mr. W. T. Tew on Purification 874
Mr. J. Young on Prepayment Meters 875
Recent Discoveries Relating to Gas Lighting 877
The Recovery of Bye-Products from Producer Gas 878
Dimensions of Gas-Works Plant 879

REGISTER OF PATENTS:—

Gas-Generating Plant—Thwaite, B. H. 880
Treating Liquid Hydrocarbons and Producing Gas and Bye-Products therefrom—Dvorkovitz, P. 880
Manufacture of Gas-Purifying Material—Campbell, J. E. . . . 881
Incandescent Gas-Lamps—Hempel, F. W. H., and Gumpel, M. . 881
Preventing Naphthalene Deposits in Mains and Services—Bueb, J. 881
Decomposing Carbide of Calcium—Gabe, H. 881
Patent Notices 882

CORRESPONDENCE:—

The Oil-Gas Experiments at Bradford 882

LEGAL INTELLIGENCE:—

A Moot Point under the Metropolis Water Act, 1871 882
Stealing the Brentford Company's Gas 882
The Supply of Gas Companies' Accounts 882

MISCELLANEOUS:—

The Gas Question in Liverpool—Sir A. B. Forwood on the Proposed Competitive Gas Supply—Alderman Smith Criticizes Mr. Livesey's Letter 883
Leeds Corporation Gas Supply—How the Debt on the Gas-Works was Liquidated 883
Gas-Works Extensions at Rochdale—The Development of the Undertaking 884
The New Holder at the Middlesbrough Gas-Works 884
The Dvorkovitz Oil-Gas Enrichment Process at Bradford—Mr. Isaac Smith's Offer 885
The Proposed Purchase of the South Molton Gas-Works by the Corporation 885
Meeting of the Ceará Gas Company, Limited 885
Austrian Incandescent Share Company 885
Electric Lighting Notes 886
Metropolis Water Supply—The London County Council and the Water Question; The Deputy-Chairman's Memorandum on the Purchase Question; The Quality of the Water in September . 887
Guernsey Water-Works Company, Limited 888
Chesterfield Water Supply—A Serious Drought 888
Exeter Water Supply—Important Extensions of Works Suggested 889
Plymouth Corporation Water Supply 889
The New Works of the Newcastle and Gateshead Water Company 889
Notes from Scotland 890
Current Sales of Gas Products 892
Coal Trade Reports 892
Gas and Water Companies' Stock and Share List 892

PARAGRAPHS:—

Mr. C. R. Bellamy on Burning Gas—Presentation to Alderman Wood—Obituary—Frank Wright's Prepayment Gas-Meter Corporation, Limited—The Sydney Water-Works 867
Defects of Water Meterage Systems 868
Personal 869
Local Authorities' Indebtedness—The Value of Sedimentation in the Purification of Water 872
The Future of Acetylene 878
Incandescent Gas Lighting for Roads 879
The Proposed Lighting of Laira—Sales of Shares 882
The Proposed Water Trust for West Kent 884
Water Supply at Fires—Fatal Accident at the Kidderminster Gas-Works 886
A Ghastly Discovery at Beckton—The Water Scheme for Malvern Link—Alleged Deficient Water Supply in the Rhondda Valley—Labourers' Wages at the Leeds Gas-Works 891
The Water Supply of Perranporth and St. Agnes 892
Sale of the Uffculme Gas-Works—River Pollutions and Water Supplies in the West Riding—The Gas Supply of Brighouse and Rastrick—The Position of the Shrewsbury Water Supply . . 893

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The Popularization of Good Investments.

THE current *Quarterly* contains an article entitled "The "Triumph of Conservatism," designed to extract the moral of the last General Election, as well as to forecast its results upon the course of practical legislation. It is not for us to discuss the politics of this essay; but we may be permitted to notice that the Reviewer thinks that the present Administration will be bound to devote early attention to certain questions, among which are included employers' liability, old-age pensions, and the purchase of their own houses by the working classes. All these topics of the day have been discussed at some length in our columns, in the light afforded by knowledge of the conduct of a protected branch of trade. The interest of the followers of the gas industry in such questions is immediate and particular, inasmuch as it is in the wide range of experience of gas managers that the most trustworthy teaching is to be found respecting the bearing of labour costs and charges upon the total expense of production. Thus, in the matter of employers' liability for accidents to workmen, the Reviewer has to argue that if a definite liability of this kind were created, "employers would gain instead of lose by being "subjected to a calculable risk instead of, as at present, "to an incalculable risk, enhanced by the costs of law "and the caprice of jurymen." He further observes that "political economy proves that the cost of all permanent "charges on any particular industry is borne in the long run "by the consumer, not by the producer." In gas-works accounts, this fact is visible on the surface, so that there is no need to invoke an insufficiently understood science to prove it. The remark, however, is interesting as showing that what are, in respect of private trading, the presumptions of a theory, are realized in the every-day transactions of a statutory gas undertaking. The inference is therefore that the presumptions in question are just.

With regard to the purchase of their houses by the working classes, this idea of contemporary politics derives its main support from the discredit that has of late years overtaken provident building societies. There can be no doubt that something ought to be done to supplement the Post Office Savings Bank as a means of employing small savings. The enormous increase of the deposits in the Savings Bank, which was noted in the last Budget speech, is satisfactory in more than one respect. But, on the other hand, it has certain drawbacks of which successive Chancellors of the Exchequer will feel the gravity more and more as time passes. It is useless to urge thrift upon the working classes, unless they can be shown at the same time how to use their savings to their own and the general advantage. With this view, we have long urged upon those whom it might concern the duty of rendering municipal loans and gas and water stocks available by the small investor. If Government can do anything to facilitate and popularize this policy, we believe that more will be done in the cause of thrift than can be shown by paper arguments. Now, as in all ages of the world, one of the first duties of the leaders of the people is to extricate the universal from the particular, to exalt the spirit above the letter. So when the ordinary newspaper politician, or even a Quarterly Reviewer, talks about the purchase of dwelling-houses out of savings, he needs to be corrected, and his true meaning expanded so as to embrace facilities and rewards for the exercise of thrift in general. By all means let the workman be encouraged to found a home of his own, from which he cannot be evicted by a grasping landlord; but let him also be provided with opportunities for becoming interested in the prosperity of his own local government, and in the expansion of the great vested interests and statutory undertakings which fill so large a part of his industrial environment.

The Midland Meeting.

THE autumn meeting of the Midland Association of Gas Managers was held in Birmingham on Thursday last—Mr. W. R. Cooper, of Banbury, the Vice-President, in the chair, in the enforced absence of the President, Mr. George Winstanley, of Coventry. Although it was the annual general meeting of the Association, the attendance of members was small. Mr. Cooper was elected President of the Association for the ensuing year; and Mr. Alfred Colson, of Leicester, Vice-President. Two papers were read at the meeting—one by Mr. John Young, of Hanley,

giving "Two Years' Experience of Prepayment Meters," the other being a short statement respecting "An Incident "in Purification," communicated by Mr. W. T. Tew, of Warwick. Discussions followed. Mr. Young's experience has run pretty well upon familiar lines; but it was worth publishing, if only because every District Association of Gas Managers should have an opportunity of putting upon record the view of members regarding such a question of the day. The paper itself is a candid statement of the circumstances of what deserves to be described as another triumph for the automatic prepayment system of gas supply. The first prepayment meter was fixed in Hanley in March, 1893; and by June 30 last the number in use had risen to 1184—the number of ordinary meters standing at the same period at 5837. After this, there can be no question as to the popularity of the new system in this particular community. It is satisfactory to learn, moreover, that the extension of the prepaid branch of the business in Hanley is coexistent with a steady increase in the number of ordinary meters in use. Mr. Young describes several interesting peculiarities in regard to the application of the prepayment system in Hanley. He testifies emphatically to the profitable character of the system; and he makes a good point of the circumstance that the prepayment gas-meter is an excellent means of recovering premises wherein the use of gas has been discontinued. He claims that the system thus assists in "developing capital which has already been expended, "but has become unproductive." It may also be expected that the system will gradually have an effect upon bad debts for gas and the obsolete deposit system. Mr. Tew's paper was an interesting exposure of the unexpected results that may follow the common practice of making the tar-well the general receptacle for all the fluid residuals of gas manufacture.

Permanence for Gas and Water Stocks.

In the course of a recent discussion by the London County Council of the Metropolitan Water Supply, actual and possible, one of the speakers uttered an observation that has a direct bearing upon the question of gas finance which we have lately debated in these columns. Speaking of the capital sum that would be required to buy out the Water Companies, he declared that stock issued by a public authority to represent this amount, whatever it might be, should be made permanent, and the control of the undertakings should be vested in a Trust. This is getting upon all-fours with the idea we have endeavoured to establish as to the right treatment of gas capital. If it is wrong to redeem the capital of a Gas Company, what makes it right to do so for a Corporation Gas Department? As the question stands at present, therefore, it looks very much as though the fairest way to treat all gas capital would be to reduce the amount, as imperceptibly as may be, to something approximating to the actual value; and then to treat the remainder as permanent. Certainly, it appears that the gas undertaking of any and every local authority ought to stand in the local balance-sheet for what it is worth; and this cannot be effected under the present system of municipal finance, which, it may be contended, was not designed to embrace capital applied to industrial or mercantile uses.

Concerning the Retiring Gas-Meter.

Not so long ago, it would have been regarded as the height of eccentricity for a popular author, with pretensions to being esteemed as a person of "light and leading," to confess to a liking for gas-light. Even now, it is no small proof of the possession of that kind of valour commonly called the "courage of one's opinions," by Mr. J. Ashby-Sterry, when this pleasing writer candidly tells the readers of the *Graphic* that he is "in favour of gas-light." Lest there should be any mistake about it, Mr. Ashby-Sterry goes on to declare that he thinks "a good modern gas-"light—it must be good, mind you—very difficult to beat." This is very solacious, if only for the evidence the confession discloses that somebody who is not a gas engineer has become alive to the fact that there is a difference in gas-burners, and that some are more modern than others. After this, who shall doubt that the world moves? Mr. Ashby-Sterry, however, also thinks that "gas would be "delightful were it not for its meter." His grievance is not the common, worn-out suspicion as to the proneness of the gas-meter to mendacity. Nothing if not original, Mr. Ashby-Sterry is original even in his statement as to what he dislikes so much in the harmless, necessary gas-meter. It is because the whole affair is so mysterious. "A gas-"meter has been a profound mystery to me ever since I "was a small boy; and, now I have arrived at years of "discretion, it is more mysterious than ever. Did you "ever," he asks, "know anyone who could read a gas-"meter, and was able to check the account of the man "who comes to examine it?" Alas! we fear the genial inquirer has reason here. No; we certainly never did foregather with an untechnical person who discovered any acquaintance with the mystery of index-taking; and, what is more, the most painstaking instruction upon the subject, even if it has not run off the mind of the (generally incurious) pupil, has rarely succeeded in causing him to retain the way of it from one day to another. Long years ago, it was rather fashionable for inventors to essay this forlorn hope of teaching the gas consumer to read his own meter; and several more or less ingenious devices with this object as their aim were submitted to public trial. There was the "step-by-step" index, which only showed one figure of each dial at a time through a hole in a covering plate fixed before the index. This was a very jerky affair, and never became popular with the public; while the inspectors hated it, for between the time of a man's first glance at the figures and his second after entering them, the wretched thing might jump round an apparently complete revolution. Then there was the index provided with rings upon the pointers, fondly imagined to show the consumer which figure was to be regarded. But inasmuch as the ring more frequently than not appeared to be "halting "between two opinions," it did not help the consumer much. The clock-faced meter was a later idea; but it had the drawback of being unfamiliar to the inspectors, while the consumers were not more interested in it than they had been in the old-fashioned apparatus. So it has come to pass that reading the meter has been left to the professionals; and there is probably not a single instrument of the kind in use by an ordinary consumer which attempts to curry favour with him by pretending to an exceptional degree of candour in the matter of the index. Mr. Ashby-Sterry broaches another question by asking how it is that the gas-meter "ever appears to be ashamed of "itself." He achieves a new description of the instrument as "a burly, bumptious, rubicund thing—something "between a bullock's heart and a binnacle, with a sus-"picion of a small watchmaker's shop in reduced circum-"stances about it." The seductions of alliteration must have had some influence in the framing of this remarkable description; and we hope Mr. Ashby-Sterry will live to be sorry for using such language about a poor machine that never did him any harm. He is right in his whimsical way, however—as he generally is—in drawing attention to the obscurity of position to which the gas-meter is usually condemned. "It either lurks about in dark corners in the "neighbourhood of the beer cellar, where you crack your "head in trying to look at it, or is put away in a cupboard "at the top of a high room, where it is impossible for you "to reach it." There is a remedy for this, of which the ingenious writer has possibly heard. If he wishes to make friends with his gas-meter—to see how companionable the creature can be when you are all alone with it in the house—let him get one of the "penny-in-the-slot" pattern, and he will not have any reason to complain of its shyness.

How they Pay the "Living Wage" in New York.

A striking example of the consequence of regulating municipal service upon the principle of the "living wage," or, as it might be styled with equal truth, the "Trade "Union rate of wage," is supplied by New York. Our own Progressive parties in municipal bodies have familiarized the British public with the doctrine that public employment ought to set a good example in this respect to private enterprise. Logically, it is only for the employees of a municipal department to form themselves into a Trade Union and agree upon the rate of wages they would like to receive, and communicate the figure to their superiors in office, and the rate in question would have to be paid. In New York, however, even this neat arrangement has been surpassed. The shameful state of the department of street cleaning in that city recently aroused attention; and a "new broom," in the person of Colonel Waring, well known in America as a sanitary engineer, was put in charge of it. He discovered that there was a law in operation requiring the labourers in the employ of

the city to be paid nearly double the ordinary rate of wages; and he consequently represented to the authorities that he could only get half the amount of work done that the funds at his disposal should command. He demonstrated that he could clean the streets properly for the amount appropriated, provided he could obtain authority to pay the rate of wages current in the market, and that he could give the labourers so employed steady work; or he could clean the streets imperfectly, paying the wages fixed by law, and giving somewhat irregular employment. But if the city wished to have the streets kept clean at all times, while he was obliged to pay the legal wages, it would be necessary to have a much larger appropriation. This issue was for a long time carefully avoided by the city authorities, who were responsible for the law, which was suggested by the requirements of the "political "machine." They tried to get rid of Colonel Waring. But the Press and the public liked the clean streets he provided for their use; and the city authorities yielded. They did not yield, however, on the point of the wages of their henchmen, but made an extraordinary grant—illegally, of course—out of the City Treasury to meet the additional expenses of the department. The moral of all this is sufficiently obvious.

The State of the Coal Mining Population.

In the issue of the JOURNAL for Sept. 17, reference was made to some printed statements that appeared about the same time in the *Engineer* respecting the failure of the coal miners' unions in Yorkshire and Derbyshire to keep cheap labour from flooding the pits. It was shown by our contemporary that, in their anxiety to add to the numerical strength of their trade societies, the leaders of the miners' unions had made the great mistake of enrolling, with rights of full membership, any and every man who would take a ticket. Consequently, the stronger the union was made in this way, the more congested the trade became, and the more men there were to compete for the money paid for the getting of coal. On the 18th inst., our contemporary returned to the subject. Referring again to the crisis of 1893, when the various miners' unions, more particularly in Yorkshire and Derbyshire, had sudden and enormous accessions to their ranks, it is observed that "the men "were admitted without question; the leaders in their "innocence imagining that the outside men had in a "moment become converted to the principles of Trade "Unionism. They were mistaken." Of course they were. They had bemused themselves with their own oratory, the burden of which was simply "Join the Union!" And they could not see an inch farther than the ends of their own noses. The members trooped in, in swarms; but it was only, for the most part, to come upon the strike funds. These soon gave out—much sooner than those who had paid into them either expected or liked. But this is the way of such funds. However, in the miners' case, both old and new union men had to come to begging; and the *Engineer* declares that "had it not been for the injudicious "help practically given to the unions by supporting their "men, and thus saving the funds, the rupture would have "come to an end long before it did, and an immense "amount of damage would have been saved to the "country." Now the miners' trade union leaders, with belated caution, have raised the entrance fees, and enacted that no member is to come upon the funds unless he has been a full contributor for at least thirteen weeks. This is all very well; but the mischief has been done. The calling is overmanned, and there are so many registered members of the unions, that the natural increase of population in the pit villages and towns will have to be deported, or some other means must be found for reducing the rigour of the competition between man and man in the same trade. This is a pretty state of things to be laid to the charge of the socialistic-minded agitators who engineered the strike for the "living wage" in Lancashire and Yorkshire.

Mr. C. R. Bellamy on Burning Gas.—Last Wednesday, Mr. C. R. Bellamy, the Superintendent of the Gas Department of the Liverpool Corporation, delivered a lecture at the Stanley Road Board Schools in that city, on "The Best Way to Burn Gas for Lighting Purposes." The address was illustrated by practical tests showing the progress made in the construction of burners since the invention of the first "cock's-comb," more than fifty years ago, down to the incandescent gas-burner. Mr. Bellamy conveyed a vast amount of useful information upon a subject upon which gas consumers, as a rule, are very ignorant. He administered a rebuke to those who complain of their gas-meters and their gas bills every quarter with the regularity of clockwork. He demonstrated how they might examine their meters and fittings, and ascertain whether or not they were receiving proper value for the gas they were paying for. Of the many descriptions of burner in the market, he advocated the use of the governor burner, which he hoped would, in the course of a few weeks, be on sale at a cheap rate in Liverpool with the Corporation's stamp upon it.

Presentation to Alderman Wood.—At the close of the meeting of the Water Committee of the Leicester Corporation last Tuesday, the Chairman (Alderman Wood) was presented by the Committee with a silver vase in recognition of his untiring services during the period of anxiety caused by the drought of last year, his watchful supervision of the new works at Swithland, and his unfailing courtesy and kindness during the whole period of his presidency. The Vice-Chairman (Alderman Coleman) made the presentation, and remarked that the Committee desired in some tangible way to show their gratitude for their Chairman's great services to the town, and his urbanity and geniality in the chair. It was a pleasure to them to bear this testimony to honest service, self-sacrificingly performed. Alderman Wood thanked his colleagues very heartily for their kindly feelings.

Obituary.—With regret we announce the death, on Tuesday last, in his 59th year, of Mr. James Eadington, who for thirty years held the position of Manager of the Blyth and Cowpen Gas Company. Of course, during that lengthy period deceased witnessed a wonderful change in the town of his adoption. The price of gas in Blyth a quarter of a century ago was 4s. 2d. per 1000 cubic feet; and the annual conumption amounted to close upon 6 million cubic feet. In 1894, the consumption had increased to 29,305,000 cubic feet, though the public lighting in the Cowpen and Waterloo districts was by means of electricity. This system, however, has now been discarded; and, to meet the further demands upon their resources, the Gas Company are engaged in very extensive developments of their works. The price of gas has, concurrently with the increase in consumption, fallen to 3s. 5d.——Mr. J. Colthurst, formerly a Director of the Bristol Gas Company, died on the 18th inst., at the advanced age of 85.——Mr. R. Prall, the Solicitor to the Brompton, Chatham, Rochester, &c., Water Company, and to the Higham and District Water Company, died on the 20th inst., in his 66th year. Deceased was Town Clerk of Rochester.

Frank Wright's Prepayment Gas-Meter Corporation, Limited.—In another part of the JOURNAL will be found the prospectus of this Company, which has been registered with a capital of £100,000, in £1 shares, "for the purpose of acquiring, working and selling, or otherwise dealing with the completed patents and applications for patents (or rights relating thereto) and the several future improvements thereon, as set forth in the contracts, of the coin-freed or prepayment gas-meters, invented by Mr. Frank Wright, for the United Kingdom and colonies, Canada alone excepted;" and for generally carrying on business as manufacturers of, and dealers in, coin-freed or prepayment gas-meters, dry and other gas-meters, and all apparatus connected therewith. The Company's Articles of Association have a feature which is certainly unique in the history of joint-stock undertakings; for, instead of the customary seven signatories—usually unknown persons taking one share each—there are no less than 132, who will subscribe for more than £40,000 of the capital required. The subscription list will be opened at ten o'clock on Thursday, and close at or before four on the same day for London, and the following morning for the country.

The Sydney Water-Works.—A description of the Sydney Water-Works appears in the seventh annual report of the New South Wales Metropolitan Board of Water Supply and Sewage. The source of supply is from the Nepean River and two of its tributaries—the Cordeaux and Cataract Rivers. The catchment area is about 354 square miles. Across the Nepean River is built a concrete dam 10 feet high, which is designed to divert a portion of the stream only into the tunnel, and lift it to the level of the crown. The water is then taken by a tunnel, 4½ miles in length, to the Cataract River. Another concrete dam, similar to that on the Nepean, is thrown across this river just below the outlet of the tunnel from the Nepean. The water is thence conveyed by a tunnel for about 1¾ miles, and then by a series of open canals and tunnels, making a total distance from the source of about 40½ miles, to the Prospect reservoir. There are 11⅜ miles of tunnels, and about 28¾ miles of open canal from the off-take to the Prospect reservoir. This reservoir covers an area, when full, of 1261 acres, and has a capacity of 10,812,313,000 gallons. The dam is earth with a clay puddle core, is 7300 feet long, has a maximum height of 84 feet, with slopes of 3 to 1 on the water side, and 2½ to 1 on the outer side, and is 30 feet wide on the top. The water face is covered with heavy bluestone pitching. When quite full, there are 6,744,343,000 gallons available by gravitation. The water is drawn off from the reservoir through a valve-tower into pipes placed in a brick tunnel, and conveyed to the Pipe Head Basin, situated 16¼ miles from Sydney, and thence by a wrought-iron pipe, 6 feet in diameter, to the tank at Pott's Hill, a distance of five miles. This tank holds 100 million gallons, and is designed to tide over any interruption of supply from Prospect reservoir, as well as to prevent fluctuation of pressure.

WATER AND SANITARY AFFAIRS.

THE Progressives in the County Council, defeated in their scheme for spoliating the Water Companies, have now called upon the Moderates to "declare a policy" on the subject of the water supply. Of course, this is assuming that some change has to be effected in the present system. It is taken for granted that London is anxious for the Water Companies to be got rid of, and for the supply of water to be placed under some different management. This postulate may be disputed; but there can be no doubt that the Progressives are animated by the strongest possible desire to place the County Council in the position now occupied by the Companies. Their transfer scheme being thrown overboard, they now call upon the Moderates to say what shall be done. The Parliamentary Committee, imbued with the principles of the Moderate party, proposed that the Government should be "invited" to deal with the question, or to appoint a Royal Commission to undertake the task. Were the present Government that of Lord Rosebery, such a proposal might flatter the hopes of the Progressive party. But the case is now altered, and the Progressives lack faith both in Parliament and the Government. They may even be thankful that their Transfer Bills have been, as they say, "wrecked," after six years of toil and trouble. They would never have carried their Bills through the present Parliament; and they are now spared the ignominy of such a failure. Perhaps the Moderates had been wise if they had left the Progressives to hang themselves with their own rope. The defeat of the Progressive tactics had become certain. Now the Moderates find themselves saddled with the responsibility of formulating a policy. That is to say, as they have proposed that an application should be made to the Government to undertake the water question, they are called upon "to "report without delay the lines on which they suggest "that the Government should be asked to legislate." They have already gone so far as to say that the supply of water to London and its environs "should be in the hands of a "public authority." But this is not policy enough for the opposite party. At the meeting of the Council last week, Dr. Collins's amendment to the recommendation of the Parliamentary Committee expressed a desire not merely that the water supply should be in the hands of "a" public authority, but that the authority should be the County Council. This was declared to be the Council's own desire, of which there could be no doubt, if by the "Council" we understand the Progressive party.

That the Progressive majority in the County Council have the least intention of adopting such "lines" of legislation as the Parliamentary Committee may be expected to recommend, is in the highest degree unlikely; and the task set before the Committee is a mere waste of time. Dr. Collins's motion, carried on a division by a majority of nine, is immediately at variance with the intentions of the Moderate party as to the public authority which shall have charge of the supply. The antagonism on this subject is shown by the circumstance that Mr. M'Kinnon Wood, although Chairman of the Parliamentary Committee, not only refused to move the adoption of the Committee's report advising an application to the Government, but has since resigned his post as Chairman of that Committee. The gulf is thus widening; and we see the County Council presenting the appearance of a house divided against itself. As elected by the ratepayers, there is at the present time a majority of one on the Moderate side. In respect to the Aldermen, there is a Progressive majority of seven. Thus the Progressives gain a majority of six—perhaps enlarged to-day, in supplying Mr. Ritchie's place. That six is not a working majority is shown by the vote of a fortnight ago, when Mr. Stuart's amendment to proceed with the Transfer Bills was lost by a majority of one. Even last Tuesday, when Dr. Collins's amendment was put to a show of hands, there was again a majority of one in opposition; the proposal being only saved by the subsequent division. It is perfectly true, as stated by the Earl of Onslow, that, after six years of power, the Progressives have "failed utterly and signally" in their efforts to settle the water question. To ask the Government to take up this question is to confess that Lord Onslow is right. To think of laying down the lines on which the Government is to act, however suggestively this idea may be put, is distinctly Progressive, and none the less absurd. If the Council know what should be done, let them bring in a Bill for the purpose. But what Bill can they possibly prepare? They have had Water Bills—eight of them, and they are all "wrecked." What is to be the future of this question? Mr. Costelloe may enlighten us. He says "the Council are not prepared to take a single step in the "matter until it is fully understood that the London "County Council is to be the Water Authority for "London." But what says the *Daily Chronicle?* It distinctly fears that the water supply will rest where it is "for many a year to come." Even the County Council must bow to the inevitable. Whether, as the Council have to step aside, the Companies can come forward with an acceptable scheme, is another consideration. No man is indispensable; and very possibly, in regard to the water question, London can do fairly well without the County Council.

In the debate at Spring Gardens on Tuesday last, the motion brought forward by Dr. Collins having been carried, a rider was added, of which Sir John Lubbock had given notice, requiring the publication of a memorandum which had been drawn up by the Deputy-Chairman, Mr. W. H. Dickinson, on the subject of the water supply. A copy of this document made its appearance on Friday in the morning papers, generally in a condensed form. The full text is of considerable length; but we give the principal portions in another column. Here, at all events, we meet with a policy and a programme sufficient to satisfy the most exacting Progressive. Why ask the Parliamentary Committee for anything more? Mr. Dickinson proposes for the Legislature to enact that the powers of the Companies "shall absolutely cease and determine in 1931, "and that in that year the Council shall take over their "undertakings, or so much as it requires; paying therefor "the actual value of the plant and materials so taken over." This practically applies tramway law to the Water Companies, though the capital appertaining to the latter was raised without any stipulation by Parliament for an ultimate surrender of the property on the basis of "the actual value" of plant and materials. This extraordinary application of the *ex post facto* principle is described as "not unfair to the "Companies." They would be left in the possession of a valuable property for forty years; and though it would be gradually decreasing in value, the shareholders would be spared a "sudden destruction of their property." As for the capital loss, "a slight reduction in dividends" might provide a reserve fund to meet the contingency. These and sundry other propositions of a like character stud Mr. Dickinson's memorandum; and he suggests their embodiment in a General Bill to be brought into Parliament by the Council. This gentleman calculates that the water-works, as they now exist, "are not worth to the "purchasers more than £10,000,000," though they were valued in 1891 at £37,000,000 of Metropolitan Consolidated Stock. It is well to know, as precisely as possible, what ideas prevail at Spring Gardens on the financial part of the water question; and the Companies may feel obliged to the Deputy-Chairman for having enlightened them on the subject.

Defects of Water Meterage Systems.—At the recent meeting of the New England Water-Works Association a discussion arose upon the supply of water for all purposes by meter. As to the testing of water-meters, it appears to have been the general opinion that meters registering against the consumer are not often met with. As a rule, the effect of wear and hard usage upon a water-meter is found to make it register slow; and several members agreed that durability is more to be desired in such an apparatus than accuracy of measurement. Yet it is evident, from the statements of some speakers, that there is some practical difficulty in balancing serviceability against sensitiveness in these appliances. It was asserted that, in some metered distribution systems, about twice as much water is pumped as the total registration accounts for. This seems to be an important point, as bearing upon the idea entertained by some English water-works engineers that the general adoption of water-meters would tend to reduce unaccounted-for water in British towns. One member of the Association declared that "in one town where every fixture was metered, they could account by this means but for 50 to 60 per cent. of the water consumed." Seeing that several other speakers had stated that they did not pass, for fixing, meters showing an error of more than 1 per cent., this allegation appears to require evidential corroboration. If true, it destroys the only case that can be sustained for the general introduction of water-meters.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 892.)

All attention on the Stock Exchange is centred in the Kaffir Market, and is likely to remain so for some time longer. The past week was highly exciting; and its history might be summed up in a daily record of ups and downs, according as the crowd ran in to sell, or the big men stepped in to stop the rush. As time went on, the kaleidoscopic changes became more rapid; and when on Saturday the settlement commenced, the quick turn became almost bewildering. In this state of things, the other departments could not hope to have a quiet existence; being liable to derangement by the turmoil going on near them. As a matter of fact, they were all flatter; and the Railway and American markets had their own troubles into the bargain to help to depress them. Consols were almost alone in showing a rise. The Money Market was in a somewhat healthier condition, and better rates were obtained. Business in the Gas Market was very slack during the earlier portion of the week; and though it grew more brisk later on, the volume of transactions, on the whole, was below the mark. Movements in price were decidedly irregular; for while very considerable advances were scored by some issues, there were just as many that went the other way. Nearly all of those which retrograded, however, had recently been very liberally moved up; and so a slight reaction in their case was always on the cards. Gaslight "A" showed weakness. Opening at 295½, it slid gradually away, and the closing mark was 293—the lowest of the week. Business was somewhat brisker in the secured issues; and prices were about a good medium. There was more doing in South Metropolitans; and, less support coming in, the "B" failed to maintain the phenomenal point to which it had advanced. In Commercials (the very inadequate quotation of which we lately pointed out), some stock came into the market; and the price took a big jump at once. But even now the new stock, which is in no way inferior to the old, stands ten points lower than it should be in order to be abreast of the old. Business in the Suburbans and Provincials was, of course, very limited; but some changes took place. Brentford new was reinstated, and Brighton rose smartly; but British, which had been going ahead too fast, was set back half a point. The same thing occurred to Continental Union; and Imperial also receded. Among the rest, San Paulo and Buenos Ayres were also lopped of some of their rise. Water was almost stagnant; and the only move was a fall in Lambeth 10 per cents.

The daily operations were: Business was very sluggish on Monday, and nothing moved. On Tuesday, everything was just as inactive; and the only move was a fall of ½ in British. The market began to arouse on Wednesday; but prices were not very good. Brighton improved 3; but South Metropolitan "B" and Imperial fell 2 each. On Thursday, transactions were no more numerous; but there was considerable change in quotations. Commercial old rose 3; and Brighton and Brentford new, 2 each; but Continental Union fell 2; Gaslight "A," 1; San Paulo, ½; and Buenos Ayres, ¼. Friday was a good deal more brisk. Commercial old rose 10; and ditto new, 9. In Water, Lambeth tens relapsed 2. Business was well up to the mark on Saturday; but quotations did not move.

ELECTRIC LIGHTING MEMORANDA.

The Stafford Electric Light Undertaking—The Character of the Stafford Plant—How Shall the Prospective Demand for Electric Light be Ascertained?

An addition has been made, in the case of Stafford, to the number of municipal electric lighting undertakings placed under the control of the corporation gas engineer. We have much pleasure in congratulating the Stafford Corporation Gas Committee and their Engineer, Mr. J. Ferguson Bell, upon the successful inauguration of their new department, which is the fruit of an inquiry and report commenced by Mr. Bell in 1889. It speaks well for the thoroughness of this initial investigation that many of the recommendations offered by Mr. Bell five years ago have now been carried into effect. As in the case of Leicester, the hospitality of the Stafford Gas Committee has been extended to the electric lighting plant, which is installed upon a site found for it at the gas-works. When Mr. Bell first went into the matter of electric lighting, he deemed it necessary to warn the Corporation that they ought to make sure of their customers before venturing upon the proposed undertaking; and he suggested that there should be an annual revenue of at least £2400 "in sight" to justify the speculation. Naturally enough, a canvass of the householders in the proposed electric lighting district showed only a couple of names as representing the local demand for the new system; and accordingly the scheme was "hung up." In 1893, however, upon the eve of the expiration of the Provisional Order, the question was revived, and the opinion of Dr. John Hopkinson was taken upon the suitability of Stafford for a municipal electric lighting venture. As was to have been supposed, Dr. Hopkinson entertained no doubt at all upon the point. He could not see much promise of a large demand for the electric light in the town. But, on the other hand, it was undeniable that the local conditions favoured the production of electricity at a low cost; and the prospective area in which it would be consumed, if at all, was compact. Consequently, Dr. Hopkinson's advice to the Corporation was like that of the immortal Pooh Bah, when acting in his capacity of solicitor to Koko—to "chance it." What this same eminent authority's advice would have been if consulted in a different capacity, must remain matter of conjecture. At any rate, he completely relieved Mr. Bell, who as a resident in the town would have had to bear the brunt of any failure of the venture, from all the major responsibility of advising the Corporation to undertake it. As to the minor responsibility of designing the buildings and seeing to the execution of the work generally, Mr. Bell would, of course, have no objection to do his best for the Committee and the town and there is a consensus of testimony as to the manner in which this part of the work has been done.

With regard to the electrical features of the Stafford plant there is not much to be said. The plans being Dr. Hopkinson's, the system embodied in them is on his own low-tension, three-wire principle. Dr. Hopkinson did not think well of gas-engine driving for his dynamos; and so he has put down three of Messrs. Marshall and Co.'s well-known horizontal steam-engines, supplied with steam by as many Lancashire boilers fitted with Meldrum breeze furnaces. Every engine drives its own dynamo; and there is a battery of chloride accumulators to balance the current and take up the lightest loads when the demand is not sufficient to employ an engine. According to the detailed account of the works and plant published in the *Electrical Review*, it has been arranged that at such periods of light load the boilers will be used to supply steam to the gas-works, and hence will always be under steam to meet a sudden demand. "In return for this advantage of using the steam, the Gas Department will supply to the electricity works all their refuse coke and coke screenings free of charge." This is a nice arrangement for transferring to the Gas Department all the fuel account for the electric lighting plant. The charge for current is to be 8d. per unit up to a maximum demand of 1½ hours per day, and half the price after this, according to the Brighton system.

It now remains to be seen whether Mr. Bell's caution or Dr. Hopkinson's confidence will be justified by the amount of patronage extended to the Stafford municipal electric lighting venture. In a matter of this kind, it is admittedly difficult to find a sure datum whereon to base an estimate of probable business. Mr. Bell wanted to make sure; and the Corporation ordered a canvass, with the result already stated. Dr. Hopkinson went upon general principles; and it will make no difference to him whether his forecast proves to be right or wrong. The responsibility for launching an undertaking of this kind rests entirely upon the members of the Local Authority themselves; and there are plenty of examples to show how easily persons in this situation may be deceived. There is just now, for instance, a question as to the desirability of the suburban district of Wimbledon going in for public electric lighting, under the guidance of Mr. Preece. Naturally, he tells them that there is not the smallest risk about the project—the Local Authority have only to pluck up courage and be "enterprising," and all will go well. Reminded of the state of affairs in the neighbouring town and similar district of Kingston-on-Thames, this same "guide, philosopher, and friend" of all communities in regard to matters electrical, calmly admits that the Kingston Corporation made their plunge before they had sufficiently assured themselves of the extent to which private residents would support the undertaking. What, then, is a local authority to do? If they take a canvass, the result may be misleading; for few people care to pledge themselves to support a business which does not exist. On the other hand, if they go upon general principles, what are the principles which may be trusted to indicate correctly in such a matter? We believe that the most trustworthy of indicators in this connection is rateable value, intelligently regarded in combination with commercial turnover, manufacturing output, and the general style of a district. Just as shopkeepers know what style of goods to stock for a local trade, and make money—or do not know, and become bankrupt—so must local authorities gauge the probabilities of the demand of their districts for electric or other systems of lighting. It would not be surprising to hear that there is a parity between the consumption of champagne in a particular district, and the demand for electric light by private residents. Let this remark stand, however, for an illustration of what we mean in this regard. Professional electrical advisers of corporations do not talk in this vein. They prefer to dazzle the members of local authorities, always disposed to believe great things of their town, with reference to what is done in places of widely different character; and thus public money is often squandered.

Personal.—Owing to the calls upon his time necessitated by the duties incidental to his position as one of the parliamentary representatives of Ipswich, Mr. D. Ford Goddard has decided to resign his seat on the Municipal Council.——We learn that Mr. M'Kinnon Wood, the Chairman of the Parliamentary Committee of the London County Council, has resigned that position, owing to there being a majority of Moderate members upon the Committee.

UPON SUNDRY LABOUR QUESTIONS.

THE actual industrial situation is somewhat peculiar; a revival of trade—or rather, to be more exact, an improvement of the condition of certain trades—having brought about the inevitable concomitant strike for higher wages by some organizations of skilled workmen, while the members of the Coal Miners' Unions, and other followers of rough trades, have enough to do to make their "living wage" by every successive week-end. The first of these circumstances of the hour is discussed in every newspaper and in most technical journals; but not, in any instance that has come under our notice, in connection with the question of profit-sharing—the only system that can be relied upon to prevent strikes. It is again made manifest by the Clyde and Belfast trouble with the working engineers and their allies that when it comes to a question of striking or not striking, the "old" unions of skilled workers are quite as likely to "take it fighting" as the "new" unions which are supposed to differ from them so greatly in many respects. For our part, we have never been inclined to compound with the principle of Trade Unionism for condemning the manœuvres of the new unions by praising the older organizations. We have not been able to forget the performances of the Sheffield trade unions of the last generation—unions of skilled workers surely, if such could have been found anywhere—and cannot believe that organizers of close societies avowedly existing for the sole benefit of their members will ever be squeamish as to the means they employ to gain their ends. It stands to reason that the responsible managers of trade societies with money as well as credit to imperil by any indulgence in lawlessness will be chary of encouraging violent counsels in regard to the conduct of disputes with employers. Moreover, the more perfectly they succeed in getting within their membership all the available followers of trades which cannot be learnt in an hour by the first comer, the less will be their temptation to practise other than waiting tactics for bringing disputes to an end. All the same, when it is brought to ultimate analysis, the way in which the old trade unions apply the principle of unity in practice will be found to differ very little, if at all, from that favoured by the new unions. It should not be overlooked by those who reflect upon this similarity of methods in Trade Unionism, that some of the most savagely-conducted of the conflicts of new unions were carried on under the auspices of men who had learnt in an old trade union of what spirit the creature really is.

The fact that the professional leaders of the new unions are more patently infected with the socialistic taint than the more experienced heads of the older trade organizations, constitutes a difference of detail—it might be said, of ornament—rather than of essence between the two classes of trade societies. The new unions are so many mobs, influenced, as mobs are influenced, by power of tongue and lung; and professional Socialists are apt at this kind of thing. The old trade societies are largely composed of respectable men—family men, and men with money savings. It is useless to dangle Collectivism as a bait before such hard-headed as well as horny-handed customers. The leaders they are prepared to follow are not street-corner spouters, but men like themselves, with a bit of money laid by, and a keen eye upon the means of increasing the store. Yet does anybody think that such men will shrink from fighting their employers to the last gasp, if they are convinced that their wages ought to be a halfpenny an hour more? Not they; nor are they men to stick overmuch at the adoption of any means for gaining their end. They will not stone a recalcitrant employer, or go whining to a Lord Mayor for help before they have been out a month; but there is that in them which would render their company undesirable by a "Free Labourer" of their own class when they had grown desperate.

It is easy to perceive why the labour troubles of the new unions appeal more affectingly to the public, and to the mischievous order of fashionable philanthropists (at other people's expense), than do those of the old ones. The latter, when they are not ordered "on principle," with which the public have no concern, are always upon questions of work, or wages, or working hours. The philanthropist may regard with vague benevolence the spectacle of a body of comparatively well-to-do artizans in conflict with their employers upon the question of whether they should be paid a halfpenny an hour more or less, or whether the factory bell should ring at this or that hour. He may entertain a general impression that the men are probably in the right of it; but so far as he and his class are concerned, the issue is no concern of theirs. There is nothing to be made out of it by an impartial "conciliator" who would have to begin by confessing that the considerations bearing upon the point at issue were too technical for him to understand, much less to pronounce judgment upon. But when it is a case of a whole industrial population of poor fellows claiming no more than a "living wage," which the ogre-like employers do not see their way to paying—ah! then the philanthropist (at other people's expense) sees his chance; and usually, like Bret Harte's hero, he "goes for it then and thar." There is no technical knowledge required, it is thought, for the understanding of a question as to the rate of remuneration of unskilled labour. If the employers happen to be a national government, a municipal corporation, or a statutory company, their duty is plain—they must not only pay a living wage, or pay according to the trade union standard for the district; they must go farther, and "set a good example to other employers." What this means under conditions favourable for the growth of abuses in municipal administration has been published in connection with the reformation of the New York city cleaning service. Here the rate of pay for labourers in that service is actually fixed by law at about double the current rates; and although this step was originally taken for political ends, and in order that the employees might be able to contribute liberally towards the support of what is called "the machine," yet there is no public protest against it, for the reason, as a writer in the *Forum* thinks, that the doctrine of the "living wage" exerts a silent but powerful influence in checking any movement to cut down wages paid to city employees.

The responsibility for rendering this doctrine fashionable is placed by the American writer upon the English municipal bodies who, to the number of two hundred and fifty, are reputed to have adopted the principle, in remunerating their workpeople, that wages ought not to be allowed to sink below the "moral minimum," which is not fixed by the resolve of the labourer not to work for less, but by the sense of the employer of what he needs in order to enable him "to maintain a proper standard of living." The benevolent motive underlying this conduct is affirmed by the American critic, who, however, goes on to show "that whatever increase of wages is thus apparently brought about, is the result of subtraction from the wages of those who do not share the favour, as taxation is borne inevitably by the consumer, and the increase of pay to municipal workers is only possible by increase of tax rate. . . . The whole class must pay for the privilege granted to the few." The writer concludes that "the system is open to serious abuse and public danger; that its effect upon general industry is mischievous; and that safety and economy are to be found only in the application of the same business principles to public business that have been proved by experience to be sound and safe in private affairs."

As sceptics of the principle of Trade Unionism, whether applied by trade societies old or new, and as something stronger than disbelievers in the weak-minded, officious philanthropy (at other people's expense) with which the struggles of the new unionists are treated by people in a superior condition in the community, who ought to know better, it has greatly solaced us to read Lord Grimthorpe's powerful letter to *The Times* of the 21st inst. It was against the socialistic twaddle vented at the recent Church Congress that his redoubtable Lordship took up his parable; but his observations hold good for any time or occasion. Somebody said at this congress that because, under the present industrial system, men who are willing to work do not always get work to do, at the wages they ask for, "therefore the present system, which only means the laws of all civilized, and, indeed, not only civilized, but all society, is all wrong, and ought to be abolished somehow 'by some form of State Collectivism'"—of a character which the speaker discreetly refrained from particularizing. "So may we," says Lord Grimthorpe, "until he condescends to tell us for what wages, or how much food, and for what time, and with what degree of energy or skill, his willing men engage to work; or what is to be done if nobody wants his work either at that price or at all, and if he cannot be employed without turning out somebody else who is now doing the work which people do want and are paying for." This is the same question, as he repeats, with which Lord Grimthorpe "posed Cardinal Manning and a Lord Mayor and other mischievous humanitarians who were encouraging one of the great strikes some years ago." This was at the historical conference at the Mansion House, when the notorious Mitchell Henry, the leader of the coal porters, declared himself in favour of "conciliation"—meaning full concession of all his demands on behalf of the union.

Lord Grimthorpe proceeds to demolish the character claimed for Trade Unionism, as constituting "the best guarantee to employers of the workmen's good faith." He goes on to state that "everybody with the smallest knowledge of these things knows that one of the main objects of the new unionism is to prohibit all excellence and all reward for it, and to inculcate the degrading doctrine that because capital and brains cannot do much without labour, therefore each labourer who does what he is directed, as elephants do very well, does as much towards the advancement of mankind as the one man who invents and organizes the work of thousands who without him could not earn twopence. Their object is to reduce all workmen to the level of the worst, as has been exposed over and over again, and never in the least refuted." It is not only the new unions, moreover, who try to level down excellence in this spirit.

Apart from this aspect of militant Trade Unionism, and reverting to the question of rate of wages, it is obvious that where profit-sharing exists, there can be no temptation to strike for increased pay supposed to be warranted by an improved state of trade. If the antecedent condition existed, it would show itself at the proper time in heightened profits for all the partners; and the funds of the unions would not be spent in testing for the fact by a method as wasteful as the legendary Chinaman's expedient of burning down his house whenever he desired to roast a pig.

AN ARCHITECT'S AND SURVEYOR'S HANDBOOK OF GAS-FITTING.

We recently had occasion to warn our readers as to the unsatisfactory character of a book intended to serve as a "popular" guide to gas-fitting. In consequence of this action on our part, we have received from the author, Mr. Sharratt—a gentleman well known in gas circles, especially round and about Manchester, as an experienced gas lighting engineer—a copy of the little handbook published by Messrs. James Stott and Co. for the guidance of architects and surveyors. It speaks much for the confidence of this author in his work that he should have been undeterred by the severity of our late criticism of another writer from submitting his book to the same ordeal. We have great pleasure in admitting that this confidence on his part is justified. It is unnecessary to give undue prominence to the secondary—or primary?—purpose of the book for advertising the specialities of a particular firm of manufacturers. It could be wished that every trader would give the world the result of his own experience in following his calling; for information of this kind must of necessity be put forward with better credentials than those which can be offered by an unknown writer posing as an expert. Naturally and properly, the present handbook omits all reference to main and service laying—matters with which the consumer has nothing to do. It rightly defines the object of fitting a building with gas piping as that of providing for "an equal distribution of gas, so that, when fully lighted up, the pressure will be found as nearly as possible equal at all points on the same level;" and draws attention to the mischievous consequence of the custom of specifying only the number of points to which gas is to be carried. Subject to the natural limitations due to its origin, the book is a trustworthy guide; a complete one, of course, it is not. In giving instruction with regard to the computation of pipe sizes, the authority of Mr. A. H. Crump (whose article on the subject appears elsewhere) is relied upon. Upon the best working pressure, the authority of Professor V. B. Lewes, who recommends a pressure of 7-10ths all round, is adopted. A good draft of a model specification of gas-fitting work is given; and this alone should recommend the book to architects and building surveyors. We have no fault to find with the general conditions of this specification, except to point out that, while the contractor is required to "test" his work, no particulars of the nature of an acceptable test are given. On the whole, a good deal more practical information is contained in this little sixpenny pamphlet than can be found in some books affecting to treat of the subject in an exhaustive manner.

MINERAL OIL PRODUCTION.*

The text-book now before us is intended to supplement two similar volumes on petroleum, which have already appeared in the series of works on chemical technology emanating from the well-known Brunswick publishing-house of F. Vieweg and Son. The present volume deals only with the oils produced by distillation from shales, lignites, and similar minerals, and incidentally with the production of paraffin, and the manufacture of candles and oil gas. There are two chief centres of the mineral oil industry—viz., the shale districts of Scotland and the provinces of Saxony and Thuringia, in Germany. Dr. W. Scheithauer, the author of the book, is attached to one of the largest works in the latter centre, and is therefore especially conversant with the raw materials and methods of distillation of Saxony and Thuringia. The portion of his work which deals with the industry as conducted in these provinces, bears ample evidence of his first-hand acquaintance with the subject; and no better guide to it could be given to the student. Reviewing the development of the Saxon-Thuringian oil manufacture, Dr. Scheithauer considers that there have been four well-marked periods in its history—the first extending up to the appearance of American petroleum on the market, in 1862; the second to the Vienna Exhibition of 1873; the third to the death of C. A. Riebeck in 1883; and the fourth from the formation of the Company for carrying on Riebeck's works, to the Chicago Exhibition, in 1893. The first period was characterized by speculation and uncertainty, though the products fetched nearly five times their present prices. The next epoch was one of the keenest competition with a most powerful rival, and was marked by the rise, under the stress of opposition, of more careful and scientific methods of distillation. But the end of this period witnessed the first employment of vertical retorts, which have now entirely displaced the early horizontal forms. The third period saw many more competitors besides American petroleum; and the oil-gas market was for a time almost entirely given over to the Scotch distilleries. The briquette industry in Germany was at this time grafted on to the oil industry; and the one helped to support the other. With the death of Riebeck and the close of the third epoch, the firms of manufacturers began to form syndicates for the better sale of their products. There had been a duty of about 3s. per cwt. on petroleum imported to Germany; and in 1885, an import duty of 5s. per cwt. was put on all other mineral oil, in order to protect the native industry. Curiously enough, it has been observed that the demand for Thuringian gas oil fluctuates in correspondence with the depression or inflation of the other large industries of the country.

This very brief sketch of the history of the German oil industry, with which the book is chiefly concerned, will give our readers a fair conception of the subject with which it has to deal. The descriptions of the retorts and methods of distillation are very complete and lucid. The rival shale distilleries of Scotland also meet with adequate treatment; and we notice that the quite modern retorts and methods of Messrs. Young and Beilby are illustrated and explained. The production of paraffin and the manufacture of candles are also dealt with at length. The large quantities of Thuringian and Scotch oil used for gas making, justify the inclusion in the book of some 60 pages on oil gas. This portion appears to partake more of the nature of a compilation than the remainder of the work; and we suspect that the author has not had much practical experience in this branch of his subject. But though the information may be at second hand, it is good; and the author has gone to the best sources for it. The Pintsch and Peebles systems claim the most attention; while Dr. Scheithauer is judiciously reticent as to the future prospects of the Tatham process. Carburetted water gas is only mentioned as an English and American departure in the utilization of oil, and is not described.

The work is copiously illustrated; and the pages teem with references to German and other works and periodicals. We can cordially commend it to those seeking a handbook on the production of mineral oil by distillation from shale, lignite, and cannel—a manufacture which is nearly related to that of illuminating gas, and which is still of immense magnitude, though dwarfed by the colossal "earth-oil" trade of Russia and America.

* "*Die Fabrikation der Mineralöle*," von Dr. W. Scheithauer. Brunswick: F. Vieweg and Son; 1895.

RURAL WATER SUPPLY.

In the period from July to December last year, there appeared in the *Builder* a series of articles on the above subject, specially prepared for students of water engineering. They have since been revised and brought up to date, and issued in the more convenient form of a book.* Of course, in such a work, there is not much scope for original thought; and the authors gratefully acknowledge their indebtedness to many standard works for the information they place before their readers. Those works, it must be acknowledged, are rather too high for the grasp of students and young engineers, to whom, it was thought, a book of a more elementary character might be serviceable. There is no examination in water-works construction at the City and Guilds of London Institute, or Messrs. Greenwell and Curry's handbook would doubtless be recommended to the attention of the candidates. The authors, in their preliminary remarks, emphasize the importance of ensuring for rural districts unpolluted water supplies, seeing that these districts are the feeders of the great towns; and they go on to give an indication as to the legal responsibilities of local authorities in this regard. Assuming that it has been decided to carry out a scheme, the steps to be taken to obtain the necessary legislative sanction are indicated. This it is recommended should be sought by an application for a Provisional Order. In this part of their work, the authors derive assistance from Michael and Will. The important subjects of land valuation, riparian rights, &c., are disposed of; and then engineering work is taken up. The first system of supply dealt with is that by gravitation, which the authors consider to be specially suitable for rural districts. The requirements of a scheme of this kind are set forth, and the leading principles affecting the flow of water in pipes are dealt with. Attention is next given to the various methods of pumping. The authors regard steam as the most economical power for heavy work; but they point out the many advantages possessed by gas-motors as compared with small steam-engines. Their remarks on this subject are followed, in natural sequence, by others on pumps, to which two chapters are devoted. The sources and measurement of water are next considered; and then the authors come to the really technical part of their work—viz., the preparation of the plans for the scheme, including levelling and surveying. All this having been done, materials have to be selected; and these are concisely dealt with. The important subject of the storage and filtration of water is taken up; and then the authors show how it is conveyed to the consumers. Pipes and their joints, fire services, valves, meters, and consumers' fittings are all touched upon. Chapters are devoted to the storage of rain water, supplies from wells, lead poisoning, and the preparation of specifications and estimates; and the book closes with some useful remarks as to the procedure at public inquiries. On the whole, the authors have placed in the hands of students a good deal of information which should be useful in preparing them for the study of the works of the recognized authorities on water engineering; and no more than this was the object they had in view. They have endeavoured, by simplicity of language and formulæ, to make themselves perfectly intelligible; and wherever it has been considered necessary, diagrams have been introduced.

* "Rural Water Supply. A Practical Handbook on the Supply of Water and the Construction of Water-Works for Small Country Districts." By A. Greenwell, Assoc.M.Inst.C.E., and W. T. Curry, Assoc.M.Inst.C.E., F.G.S. London: Crosby Lockwood and Son.

NOTES.

The Cooling Effect of Ribbed Condenser Pipes.

The design of gas condensers is one of the various practical applications to which the results of Mr. W. G. Walker's experiments upon the rate of transfer of heat through plates with variously arranged surfaces, may be adapted. These experiments were described in a paper read before the British Association at Ipswich. The method followed by the author was to observe the effect of heated air, steam, and water upon the surfaces of two exactly similar metallic tubes, one of which was plain, while the other was provided with eight longitudinal feathers or ribs soldered on to it. These ribs were spaced equally and radially round the pipe; and they were tried externally, internally, and both together. The tube was made of brass; and the feathers were of sheet copper. It was found that the presence of the ribs increased to a considerable extent the rapidity of transfer of heat, either when absorbing heat from steam or discharging it into the air. With the ribbed surface in contact with water, the speed of transfer was also increased, but not nearly to so great an extent. The greatest effect of the ribs was seen in the experiments with air. When exposed for 53 minutes in the atmosphere, after having been raised to a temperature of 210° Fahr. in a water-bath, the temperature of the externally-ribbed tube had fallen 102° Fahr.; while that of the plain tube had only fallen 69° Fahr. The addition of internal ribs to the tube produced little or no change in the rate of cooling; and internal ribs alone made but a very small difference. The effect of the internal ribs was greater when the tube was cooled in water. The external ribs were more effective in discharging heat to the atmosphere than in absorbing it from steam. The effect of winding copper wire round the tube was also tried, with the result that the temperature of the coiled cylinder fell faster than that of the plain one—the maximum difference being 6·7° Fahr. When, however, absorbing heat from steam, the effect was reversed, which is attributable to the condensation of moisture on the surface. When cooled in water, the two cylinders—coiled and plain—gave the same results. In these experiments, care was taken that the colour of the respective metallic surfaces was the same.

The Laval Steam-Turbine.

No impulse gas-engine has yet made its appearance; but the dimensions and efficiency of steam-turbines are being increased. A Laval steam-turbine developing 100-brake horse power has been made, which works with a steam consumption of something like 22 lbs. of steam per brake horse power. Recently a slight, but important, alteration in the construction of the turbine wheel has been made; every bucket being formed at the end of a radial spoke, and is a segment of a disc surrounded by a steel hoop. Thus the strength of the wheel to resist centrifugal force is so increased as to exceed any strain that can come upon it when driven at speeds far higher than those employed in practice; although as the wheel rotates at the rate of 20,000 revolutions per minute, it is evident that these strains are an important consideration in a machine of this order. The steam is admitted to the wheel by jets, which, being of an expanding conical shape, allow the steam to expand to atmospheric pressure before issuing and coming into contact with the wheel. The whole of the energy of the original steam pressure is thus spent in imparting a high velocity to the particles of steam as they issue from the jets and strike the buckets, which they do as nearly as possible in the same way as water acts upon a Pelton wheel. The velocity of the buckets must be something like one-half of the velocity of a free jet of steam. This means a considerable amount of gearing to let the speed of the wheel down to that which can be conveniently used. There seems to be a future before these steam-turbines, which are made in at least two leading types.

The Atomic Weight of Carbon.

In a paper submitted to the British Association, Mr. J. A. Wanklyn repeats the statement which he first published in 1893, to the effect that the atomic weight of carbon should be taken as 6 instead of 12. The experimental proof upon which the earlier statement was based was the existence in Russian kerosene of a series of hydrocarbons. Continuing this work, Messrs. Wanklyn and Cooper have published in the *Philosophical Magazine* a parallel investigation with a parallel result, given by a series of hydrocarbons which the knowledge of the day pronounces to be comparatively well explored and well understood. This is the marsh gas series, now regarded as the backbone of organic chemistry. In their recent researches, Messrs. Wanklyn and Cooper have employed a vapour-tension apparatus of their own construction, which they call a "tensiometer." One of the peculiar advantages of this apparatus is that by its aid the boiling-point of a very minute quantity of liquid may be ascertained. It is declared that the new instrument has a future rich in promise. In carrying out the fractionation of a mixture of liquids boiling very near together, it provides a criterion indicative of the completion of the fractionating process. Light on the question whether, in a given instance, there is specific adhesion between the constituents of a mixture, may be looked for by having recourse to this instrument, which imparts a degree of certainty and completeness to the fundamental operation of fractional distillation that was hitherto wanting. In concluding his useful paper, the author exhibits four terms of the Marsh gas series in presence of which he contends that chemists will be compelled to revert to the atomic weight of carbon which was all but universally admitted forty years ago.

Novel Construction of a Masonry Dam.

The construction of high masonry dams for water-works was recently discussed by the American Society of Civil Engineers, upon the reading of a paper on the subject by Mr. J. D. van Buren, which was briefly noticed in the JOURNAL for the 8th inst. (p. 721). In the course of the discussion, Mr. E. Wegmann observed that out of fifty-five such dams, only three have failed, and these were wrecked by faulty construction, not by erroneous design. Mr. Lindenthal suggested that heavy iron vertical rods connected by horizontal members should be built into and anchored into the masonry; thus forming a strengthening net, so that the dam could only fail by giving way bodily. Mr. Skinner described a singular dam that is now being built in California, which somewhat resembles a suggestion that has been heard of in connection with the construction of gasholder tanks. A thin sheet-iron core is employed, coated with asphalte, and its ends are cemented into narrow slots cut in the rocky walls of the valley. On each side of the iron wall there are 24 inches of concrete; and outside again is a thick wall of dry masonry. No reason was assigned for the adoption of this composite description of dam construction.

A New Industrial Pyrometer.

It is reported that, as the fruit of an exhaustive research conducted by Dr. Holborn and Dr. Wein at the Berlin testing establishment, a reliable form of pyrometer has been constructed by Keiser and Schmidt. The instrument is on the thermo-electric principle; and the main object sought was to use in its construction only such materials as could be compared with the standards preserved in the Reichsanstalt, and their thermo-chemical value thus determined. The galvanometer, which is after the D'Arsonval type, reads ordinarily from 500° C. to 1500° C.; but instruments can be prepared for still higher temperatures, as met with in water-gas generators, &c., with a scale indicating to 1600° C. These scales read both in volts, to show the electromotive force, and also directly in degrees of temperature. The new pyrometer has been tested, among other places, at the Royal Porcelain Works, in Berlin; and most satisfactory results have in all cases been attained. The only part of the instrument that needs special looking after is the cell containing the platinum and platino-rhodium couple, which is protected by a porcelain case. These cases are renewable; and a supply can be had at cost price for use when the pyrometer is exposed to the action of an exceptionally fierce blast, or of deleterious gases. Drs. Holborn and Wein recommend the instrument for all technical uses where high temperatures are employed, as furnishing a means of controlling operations likely to effect the saving of time and money, as well as fuel.

Local Authorities' Indebtedness.—At the present time, the local authorities of the country are indebted to the amount of £212,000,000 sterling, more than half of which is owing by Town Councils. Of this sum, about £60,000,000 has been sunk in gas, water, and electric lighting works.

The Value of Sedimentation in the Purification of Water.—That sedimentation plays an important part in the purification of water, was shown as long ago as the year 1886 by Dr. Percy Frankland in the case of his laboratory experiments on the removal of micro-organisms from water. That it is a factor of great importance in the storage of water in reservoirs, was also, says *Nature*, shown by him in his investigations at the London water-works. But quite recently Dr. H. J. van 't Hoff has indicated how this now recognized process of sedimentation may be taken advantage of in the abstraction of tidal water for purposes of water supply. It appears that the city of Rotterdam derives its water supply from the River Maas, and that the Company's intake is situated within the tidal area of the river. The water is, however, only abstracted at particular times—*i.e.*, two hours after high water has been reached. During this period, the river is at rest, and sedimentation can proceed unhindered; and Dr. van 't Hoff estimates that at least 50 per cent. of the bacteria present are eliminated during this time of comparative stagnation. Unlike the city of Hamburg, which before and during the great cholera epidemic abstracted tidal water from the Elbe, and distributed it in its raw condition in Rotterdam, the Maas water is submitted to filtration before delivery. In consequence, however, of a very large demand on the resources of the water-works, the rate of filtration is considerably higher than it should be; and this fact, combined with the unpleasant circumstance that the city disposes of its refuse by conducting it into the river, would naturally lead us to anticipate a bad bacterial filtrate. Dr. van 't Hoff does not, unfortunately, cite any figures for the filtrate, but states that "the very satisfactory bacteriological results which obtain at the Rotterdam Water-Works" are doubtless in great part a consequence of the improvement which takes place in this tidal water through sedimentation, rendering the raw water comparatively easy to deal with, while its microbial contents after the stagnation period average only from 4000 to 10,000 per cubic centimetre—a remarkably small number for a polluted water.

COMMUNICATED ARTICLES.

NOTES ON CURRENT TOPICS.

By "Veritas."

The incandescent system of gas lighting seems coming more and more to the front, and is receiving increasing and well-deserved attention. An interesting communication appeared in your columns on Aug. 27, with reference to the application of this system for purposes of public lighting at Margate, with special reference to its utility in exposed positions. The results appear altogether to be satisfactory, omitting the preliminary failures, which are always a necessary forerunner to success. The testimony of the Engineer to the Gas Company (Mr. H. H. Jones) as to the question of renewal of mantles is decidedly valuable; but his condemnation of the usual bye-pass arrangement, owing to its being experimented upon disadvantageously by the "holiday youth," must be taken more as a comment on the general frivolity of Margate as a health and pleasure resort, than as any generally serious objection to the system. There is no doubt that the great fault of the incandescent light is the want of durability of the "mantles." This has been much remedied by modern improvements. But a considerably increased stability can be attained by avoiding the constant shock arising rom careless lighting; and this is best obviated by the employment of a "pilot light."

That the incandescent system of gas lighting is making rapid progress, is well shown by the numerous patents dealing with this system of illumination. One of the most recent installations is that of the Paris, Lyons, and Mediterranean Railway Company, in which some 4500 lights will be required. From the results published by Mr. H. E. Jones, the Chief Engineer to the Commercial Gas Company, of experiments made by the Company's Chemist, Mr. H. Leicester Greville, it is evidently necessary, in using the incandescent light to the best effect, that the consumption should be restricted within certain limits. This can, of course, be accomplished by the use of suitable governors. The greatest tribute to any invention which receives a prominent place in modern progress, is to have its existence threatened by rivals. It appears that this is already the case with the older form of the incandescent light; advertisements having appeared in the JOURNAL for some time past that the Sunlight Incandescent Company, Limited, are now in a position to supply mantles to their customers, having previously been restrained from doing so owing to the threats of the rival Company. There is at present no published evidence to show whether the "Sunlight" mantles will be cheaper than the well-known "Welsbach." There is also no evidence to the best of our knowledge as to the durability of the modern innovation.

This much is at least certain—that where a system of lighting such as the "Welsbach" has attained a very marked degree of success, such as to induce competition, and when such competition has been to some degree a legal success, the eventual result will probably be a notable reduction in price, which will tend to popularize this special form of lighting, and therefore enable gas companies to more successfully compete with the rapid advance which is being made in electric lighting. It cannot be too widely known, in face of the many electric light installations that are taking place, that the incandescent system of illumination will give from 50 to 60 candle power with an expenditure of gas of certainly not more than 4 cubic feet per hour, which (placing the price of gas at 3s. per 1000 cubic feet—on an average, a rather high estimate) gives the cost for an exceptionally high lighting value at about one-half of a farthing per hour. This, of course, does not include the cost of renewal of mantles; but there is every reason to believe, from the progress which has recently taken place, that the durability of the mantles will be considerably improved as time progresses.

There is no apparent reason why the mantles should not be made slightly thicker, which would increase their stability. The larger proportion of material to be rendered incandescent might possibly, with the same gas consumption that is now prevalent, result in a development of a somewhat less amount of light, in proportion to the gas consumed. But, on the other hand, it is an open question whether the same amount of light as previously obtained might not be secured by a small extra expenditure of gas; and this would be more than balanced by the extra durability of the mantles.

There is one point with regard to the present system of incandescent lighting which, although not widely disputed, was adversely mentioned by Mr. Barton in some remarks made at the recent meeting of the Eastern Counties Gas Managers' Association. The question was as to the diffusibility of the light. Upon this point, there is very little doubt that this system of lighting has the advantage of great diffusive power. The writer has seen on more than one occasion a single burner placed at the meeting of four cross-roads, affording an illumination so powerful in itself, and extending over such an area, that it might have been well mistaken for a good form of the electric light. In fact, when one considers that the question of the diffusiveness of a light depends upon the volume of the illuminating flame, there is perhaps more light-emitting surface from an incandescent mantle than from the ordinary flat-flame burner used habitually for street-lighting, with the additional advantage in favour of the incandescent system that the illumination is equal in all directions.

Some considerable space has been devoted to the subject of incandescent lighting; but considering the importance of the question—not only in the present, but in the future—this may be justly regarded as permissible.

Turning from this special subject to another one equally important, there is the question of the correct method of ascertaining the illuminating power of gas sent out by any gas company working under a Special Act of Parliament. This would not possibly affect the illuminating value of gas, if some form of incandescent light were used as the standard; but, under present regulations, the method employed in testing is of the utmost importance. Under the old regulations, it was considered to be amply sufficient—even in the case of a large London gas company—that tests of the illuminating power of the gas should be taken from a public main, at not less than one thousand yards from the works. In addition to this, it was considered quite sufficient protection to the public interests that the period during which tests should be taken should be limited to the hours at which the maximum amount of gas was sent out. Although a Special Act of Parliament may require that gas should be of a statutory illuminating power of 14 or 16 candles, as the case might be, it is obvious that the company supplying such gas reasonably fulfils its obligations by sending out gas of the statutory lighting power during the period at which it is most used for purposes of illumination. It has been reserved for fussy county council men, and equally fussy members of corporate bodies who do not happen to possess the privilege of supplying gas to the public—which, vested in a private company, they term a "monopoly," but which, if owned by themselves, would be claimed as a public benefit—to alter the methods of testing. It may be in the public interest that corporate bodies, who have the power of controlling the methods of gas-testing, may consider it necessary to construe a Special Act of Parliament that, when the obligation is to supply 14 or 16 candle gas, such quality of gas must be supplied continuously at all hours of the day or night, and at all points of the district supplied. Fortunately up to the present time this policy has not been generally recognized.

At many local works throughout the country, notice has to be given to the manager, as to the time at which an official examiner wishes to test the gas; and such testing is conducted on the works. This is perhaps hardly fair to the public; but, on the other hand, the system in vogue in London can hardly be made a matter of serious complaint by any fair-minded person, who is not infected by the bias of the county council photometrical policeman. Not content with having an officially certified station in which no expense has been spared to secure efficiency, and in which all the apparatus is duly inspected and reported in correct working order by the official body known as the Gas Referees, there is a desire to resort to more stringent measures. There has recently been an increasing agitation by over-officious zealots, to endeavour to gain powers for testing the gas in any bye-street, or at the end of any dead main, that they may think suitable to select for their own purpose. Their zeal for the public, and their anxiety to expose what they imagine to be the nefarious practices of the gas companies, has been strikingly shown by the endeavours of the Chemist to the London County Council to obtain legal sanction to use the peripatetic photometer to test the illuminating power of the gas supplied to the public, at any point of the district, good or bad, which the representative official should choose to select.

That the advocacy of this system is pernicious, is shown in your able leader in the JOURNAL for Sept. 10, in reference to the proceedings of the Liverpool Corporation Committee. You graphically and correctly described this method as "snap-shot" testing of the gas. You also state, equally truly, that if this system is to be considered reliable, the regulation testing-station is altogether superfluous. The distinction between the "snap-shot" and the ordinary system of testing would seem to an average unbiassed mind to be that as applied to photography "snap-shot" means accuracy, but as applied to photometry it means inaccuracy.

There is one point of the general question which the advocates of "snap-shot" testing seem to ignore; and that is that, under the sliding-scale, the greater the amount of economy at which a company can manufacture their gas, the cheaper they can supply their material to the public. As a matter of fact, when a reduction in the price of gas takes place, the public profit to a much larger extent than the shareholders. It is well known that the raising of the illuminating power of gas from that which is derived from ordinary coal to that which is required to meet London parliamentary requirements, involves very considerable expense to the gas companies; and this naturally militates against their being able to make reductions in price to the public. There is an increasing demand for the use of gas for heating purposes, and for motive power; and these special applications are not affected by even material variation in illuminating power. If the gas companies are to be handicapped by having to supply gas of the statutory illuminating power at any hour of the day, tested at any portion of the district, they would have to materially increase the expense of their manufacture. This would mean a less possibility of their being able to reduce the price of gas to the public; and thus the over-zeal of the county councillor with regard to the pure question of

light—ignoring the advance which has been made in the development of the illuminating power of gas in modern burners—actually tends to keep up the price of gas, and thus injures the consumer, especially with regard to the large proportion of gas which is now used for purposes of heating, cooking, and motive power.

ON THE FLOW OF GAS IN PIPES.

By Arthur H. Crump.

I venture to suggest, for the use of gas-fitters, a new formula by which to determine the number of lights that may be supplied by a pipe of given diameter and length. I am aware that, in doing so, I am calling into question the correctness of Dr. Pole's formula; nevertheless, the results accruing from my revised formula agree with the recognized practice of the gas engineers of all the great Railway Companies, whose estimate of the carrying power of a pipe is strengthened by the concurrence of opinion of the best gas lighting engineers of the day.

All previously accepted formulæ fix the value of the diameter of the pipe as varying according to the power $D^{2\cdot50}$. Now this appears to be too high, since it gives a 4-inch pipe 32 times the value of a 1-inch pipe, which I have not found to be attainable in practice. The value of D is certainly more than D^2, since the square gives the sectional area only, without allowing for the enhanced value of the larger pipes which is due to the smaller amount of skin-friction in proportion to the area. But many will agree with me that this reduction of friction is not sufficient to raise the proportion of a 4-inch pipe as compared with a 1-inch pipe from 16:1 to 32:1. I, therefore, propose to ascribe to D the value $D^{2\cdot25}$, which may be also expressed at $\sqrt[4]{D^9}$; or, for the sake of simplicity in working, $D^2 \times \sqrt[4]{D}$.

There is, however, the question of the constant which requires careful consideration; and since Professor Vivian B. Lewes and others have laid down the rule that London gas must be burned at a pressure not exceeding 7-10ths in order to obtain its full illuminating value in an ordinary flat-flame burner, it becomes necessary to provide pipes of such a size as will carry the requisite volume of gas under that low pressure.

Twenty years of practical experience have taught me that, under such conditions, a 1-inch pipe will not convey more than 200 cubic feet per hour, even when the pipe does not exceed 50 feet in length, without a serious loss of pressure, and consequent unevenness in the size of the lights attached to it.

Having accepted this as a starting-point, and having also agreed that the value of the diameter varies as $D^{2\cdot25}$, the following formula is offered to gas-fitters through your columns, in the hope that (even if severely criticized) it may tend to discussion and consequent enlightenment on a point which is at present insufficiently understood:—

Formula for the Quantity of Gas that may be Supplied through Pipes used for the Supply of Gas-Burners in Domestic or Manufacturing Premises.

Let Q = Quantity of gas in cubic feet per hour.
" D = Diameter of the pipe in inches.
" L = Length of the pipe in yards.
" G = Specific gravity of the gas.
" P = Pressure in inches.

$$\text{Then } Q = 1000\, D^2 \sqrt{\frac{P \times \sqrt{D}}{G \times 2L}}$$

39, *Victoria Street, Westminster.*

PHOSPHORETTED HYDROGEN IN ACETYLENE PREPARED FROM CALCIUM CARBIDE.

By G. E. Brown, A.I.C.

In an article on "Acetylene" which appeared some time ago in the columns of the JOURNAL, it was stated that acetylene gas prepared from carbide of calcium was not found to possess the well-known odour produced when the flame of an atmospheric burner "strikes back," but that the odour of the gas resembled that of hydrogen phosphide; and the inference was drawn—implied if not expressed—that chemists had all along been attributing a wrong odour to acetylene gas. The accompanying communication, which I have translated from an article by Herr August Pusch in the *Berichte*, explains the facts, and shows most clearly that lime or other substances from which calcium carbide is to be made, should first be tested, so as to ensure the absence of phosphide of calcium in the manufactured article. If acetylene is to be of any service to the gas lighting industry, it is certainly most essential to ensure its freedom from such an objectionable impurity as hydrogen phosphide.

The calcium carbide at my disposal for the preparation of acetylene contained phosphide of calcium; and it may be safely observed that this impurity must necessarily be present if the raw material used for preparing the carbide contains calcium phosphate, since the latter compound will be reduced to phosphide during the process of manufacture of the calcium carbide. When such an impure sample is treated with water, the acetylene evolved will evidently be mixed with a certain proportion of phosphoretted hydrogen. The presence of this gas is speedily indicated by the odour of the impure acetylene; but its existence in the gaseous mixture may be still more satisfactorily established by passing the gases which are produced when the carbide is treated with water, into an aqueous solution of silver nitrate, by means of a leading tube attached to the generating vessel. It will then be found that, when the gas comes into contact with the silver solution, a dense black precipitate forms, which consists of phosphide of silver. If the tube leading the gas be inserted deeply into the silver nitrate solution, separation of a white compound of silver acetylene and nitrate ($AgC_2H \cdot AgNO_3$) speedily takes place; but this precipitate becomes gradually darker and darker in colour, and finally black, in consequence of the formation of silver phosphide. The silver nitrate in the leading tube may, if the current of gas is not too rapid, cause the precipitation of the silver phosphide; but the precipitate in the receiver will eventually be darkened in colour by co-precipitated silver phosphide. After dissolving this silver precipitate, the filtrate, which has now a strong acid reaction, is examined for phosphoric acid by means of ammonium molybdate and concentrated nitric acid, with the result that a copious precipitation of the familiar yellow precipitate of ammonium phospho-molybdate occurs.

For the quantitative estimation of the phosphoretted hydrogen, the gas evolved from 10 grammes of calcic carbide was passed through three flasks charged with bromine water. Experiment showed that, when employing a moderate speed of current, the phosphoretted hydrogen contained in the gas was completely oxidized in the first two flasks to phosphoric acid, and that this acid could not be detected in the third flask. After rinsing the bromine water from the flasks, and expelling the bromine from the liquid, the phosphoric acid remaining in solution was precipitated with ammonium molybdate, and the phospho-molybdate converted into magnesium pyro-phosphate. Ten grammes calcium carbide gave 0·0065 gramme of magnesium pyro-phosphate, representing 0·00193 gramme of P_2H_4.

From these data it follows that, since the vapour density of phosphoretted hydrogen is 33—*i.e.*, 1 cubic centimetre of the gas at normal temperature and pressure weighs 0·0029568 gramme—1 kilogramme of the calcium carbide used by me would, if uniform throughout its bulk, evolve about 65 cubic centimetres of phosphoretted hydrogen.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of this Association was held last Thursday, at the Grand Hotel, Birmingham, under the chairmanship of the VICE-PRESIDENT (Mr. W. R. Cooper, of Banbury). There was a fair muster of members; but several well-known faces at these meetings were absent.

The VICE-PRESIDENT explained that he was called upon to preside, owing to the unavoidable absence of the President (Mr. George Winstanley, of Coventry), who was away from home with the Chairman of the Corporation Gas Committee.

The HON. SECRETARY (Mr. C. Meiklejohn, of Rugby) read the minutes of the meeting held at Coventry in May last; and they were confirmed.

ADMISSION OF THE PRESS TO THE MEETINGS.

The next matter for consideration was a recommendation of the Committee—"That the proceedings of the Association be open to the technical press." The question gave rise to a long discussion, which ended in the adoption of the following resolution: "That the proceedings of the Association be open to the representatives of the *Journal of Gas Lighting* and *Gas World*."

Mr. W. T. TEW (Warwick) then read a paper, entitled

AN INCIDENT IN PURIFICATION.

The consideration of matters of apparently little consequence, sometimes leads to discoveries which eventually prove valuable; but while the experience I am now about to relate is undoubtedly a very small matter, it is much to be feared that it is not calculated to do more than excite passing interest—indeed, should it do this, the object of the author will be attained. It is extremely difficult to find anything fresh to discuss at our meetings. Naphthalene, stopped ascension-pipes, leakage accounts, and many other too-familiar topics have been talked about and written about, until we are inclined to think the last word has surely been said about them. I am, however, not aware that anything has been brought forward respecting the deposits in tar-tanks; and as my experience has been somewhat extraordinary, I venture to lay the same before you.

For some long time we had been much troubled by accumulation of sludge at the bottom of the underground tank which received the tar and ammoniacal liquor produced at our works. Our room for the storage of these products being very limited, the space occupied by the deposit materially reduced the already restricted capacity of the tank; and when pumping tar, the suction-pipe was continually being choked with it. At length things became so bad that the tank had to be cleaned; and after opening in several places the arch which covered the top,

and well ventilating the vault, we proceeded to throw out the obstructing material. Several tons of what appeared to be thick tar were removed and allowed to drain for some days, when, to my surprise, it solidified to a large extent, and the surface assumed a grey colour as the tar and liquor drained away. Upon further testing the material, I found it to consist of carbonate of lime.

The next question which arose was, how did it get there? In order to give a clear idea of the answer to this, it is necessary that you should be acquainted with our method of purification. We use for that purpose lime only; and, as you are aware, the emptying of foul lime in the ordinary manner creates a great nuisance through the liberation of so much sulphuretted hydrogen. As our works are not far from the residences of many who would take a great objection to this nuisance, we, by means of a steam-jet, draw a quantity of air through the lime before emptying. Immediately a box shows a foul test, it is turned off, the lid raised a few inches, and the blower set to work. It then draws air through the foul lime; and the oxygen in the air, combining with the sulphide of calcium, changes it into the sulphate, which, being practically inodorous, can be removed without any nuisance. The gases drawn away by the blower are then passed through a cast-iron box containing oxide of iron, and so go into the atmosphere without offence. The chemical action involved on admitting the air to the foul lime causes a great amount of heat, which is the means of evaporating the moisture contained in the lime. This, being condensed by the sides and lid of the purifiers, drains through the lime; and on passing through that portion which had not altogether been oxidized, it caught up the sulphide of calcium, and held it in solution, finally falling to the bottom of the purifier. On being pumped out, it was found to be of a deep yellow colour.

It had been our practice to empty this solution into the tank which contained the tar, and, of course, a quantity of ammoniacal liquor on the surface. This turned out to be the cause of the deposition in the tank; and the chemical action was found on experiment to be as follows: The ammoniacal liquor, of course, contains a good proportion of carbonate of ammonia in solution; and on the solution of sulphide of calcium coming in contact therewith, the carbonic acid in the ammonia, having a stronger affinity for the lime, leaves the ammonia and forms carbonate of lime, while the sulphur in turn leaves the lime and forms sulphide of ammonium. The carbonate of lime, being nearly insoluble in water, is instantly precipitated to the bottom of the tank, and in the course of time would ultimately fill it.

Having thus solved the mystery to my satisfaction, it became necessary to adopt some means of preventing a recurrence of it. This I did by having the solution of sulphide of calcium from the purifiers pumped into a separate tank, and a sufficient quantity of ammoniacal liquor added, until, by testing a sample in a test-tube, no further precipitation took place. The liquor was then run into the tar-well; and the solid carbonate of lime remaining at the bottom was removed at convenience, when a sufficient quantity had collected to make it worth while.

I fear the conditions under which the purification at my works is carried on are exceptional; and therefore few of my fellow managers are likely to be in the same predicament. If, however, any are troubled with a deposit in the tar-tank, it may be worth their while to see if it consists of carbonate of lime.

There was a short discussion on the paper, a report of which will be published next week.

Mr. JOHN YOUNG (Etruria) followed with a paper, giving

TWO YEARS' EXPERIENCE OF PREPAYMENT METERS.

Since the last meeting of this Association, the inventor of the first coin-freed prepayment meter has passed away; and although the mechanism which he invented is not the one which has been adopted by the gas profession, we must acknowledge our indebtedness to Mr. Brownhill, not only for his keenness in grasping the wants of the small consumer, but also for the mechanical ability and patient work which enabled him to devise a method by means of which the small consumer could obtain his gas supply, and pay for it as he had it, without inconvenience either to himself or the gas supplier. When, in 1888, Mr. Brownhill exhibited and explained his meter to this Association, few of us probably had realized that such a meter was urgently wanted; and few, indeed, would have cared to prophesy that within so short a period such a large number of coin-freed meters would be in use in this country. However, when once a meter was found which seemed fully to meet the requirements of the case, the number required in some of our larger cities was extraordinary; and I should have been glad if we could have had some notes on the experiences of those using large numbers of these meters, rather than the history of the comparatively small number of which I am able to speak. Our Secretary, however, insisted that the experience we have had in Hanley would be interesting, and perhaps useful, to the members; and if this should prove to be the case, I shall feel gratified.

Early in 1893, my Directors desired me to report to them on the advisability of introducing prepayment meters into our district. My report stated that where a district contained a class of people likely to take advantage of the system, it would undoubtedly be to the benefit of a gas company to supply prepayment meters, the meters themselves being a step in the right direction; but that a trial alone would show whether the district supplied by us would prove to be a suitable one for their introduction. It was decided to make this trial; and the first prepayment meter was fixed on March 13, 1893.

It was also decided that everything should be done to give the new system a fair trial, and, if possible, popularize this means of obtaining a gas supply. A meter with the prepayment mechanism exposed to view was fixed in the centre of the office window. A 5-feet governor burner was attached thereto, and kept lighted; and a placard called attention to the fact that a light equal to that exhibited could be kept burning for 5 hours for one penny. The following handbill was also printed, and freely circulated in the district: "Why burn oil, when you can have gas and pay for it, in a penny-in-the-slot meter, as you get it? Meters fixed free of cost. Call at the Gas Offices, and see one at work." Orders came in rather slowly at first; but by the end of June, 1893, we had 195 of the meters fixed. At first, I fancy, they were looked upon with some suspicion. But this was soon dispelled; and as the dark weather came on, orders arrived so rapidly that we had some difficulty in obtaining meters quickly enough to meet our requirements.

On June 30, 1894, we had 940 of these meters at work; and on June 30, 1895, these had increased to 1184. The questions naturally arise, "How many of these are really new consumers; and how many have exchanged the ordinary meter for the prepayment meter?" During the first twelve months, these questions caused a little anxiety; for undoubtedly at first some consumers had their ordinary meters changed for prepayment ones, and the number of the ordinary consumers decreased in consequence. On June 30, 1893, the number of ordinary consumers was 5587, and on June 30, 1894, it was only 5509—being a decrease of 78; but, on the other hand, our total increase of consumers between these dates was 667, so that the proportion of those who had replaced ordinary by prepayment meters was not a serious one. It was carefully explained to each consumer who wished to change, that the new method was a slightly more expensive way of purchasing gas; but nevertheless, since we were only desirous to suit his convenience, we would change his meter if he wished it. By June 30, 1895, however, all fears regarding the displacement of ordinary meters were allayed, as the number of ordinary meters fixed was 5837—an increase of 328 during the year; while the prepayment meters had also advanced to 1184—an increase of 244.

The quantity of gas to be given for a penny was fixed at 25 cubic feet, or 3s. 4d. per 1000 cubic feet, which was 7d. more than the charge to the ordinary consumer, who paid meter-rent. On July 1, 1894, the price of gas to the ordinary consumer was reduced to 2s. 6d. per 1000 cubic feet; and in the case of the prepayment meter consumer, it was decided that, instead of altering the quantity given for the penny, it would be more convenient to return 3d. for each complete 1000 feet registered by the meter. On July 1, 1895, the price of gas to the ordinary consumer was reduced to 2s. 3d. per 1000 cubic feet; and it was decided to return 6d. to the prepayment consumer for each complete 1000 cubic feet registered by his meter.

This arrangement is found to work very well. At first there were a fair number of discrepancies—the amount of money found in the box did not always coincide with the quantity of gas registered by the meter; but we have very little trouble now. Every meter is tested before it is sent out to the district, to ascertain that exactly the right quantity is put on; and it is also run down, to see that it shuts off absolutely when the last pennyworth is exhausted. Both these points are important, as it was occasionally found that a meter would not shut off completely, but would allow sufficient gas to pass to give a small light after the last pennyworth was supposed to be exhausted; and sometimes it turned out that a meter which was quite correct when only two or three pennies were put in, would not give the right amount when twelve pennies were inserted. Since the price has been reduced, any small discrepancy is easily adjusted. The gas and money are made to agree; and the balance is handed to the consumer, who, as a rule, seems to be very pleased to receive it. In the majority of cases, the balance is at once replaced in the meter; a corresponding quantity of gas being turned on. Large discrepancies, in our opinion, are the result of theft; and, by a little pressure, we have usually been able to get them put right.

The meters are read, and the money collected, by the meter inspectors. Each meter inspector is accompanied by a labourer, to carry the bag contained the coppers. At first, when the meters were few, and were widely scattered, the inspector carried his own coppers, and could only read a few each day. But as the number increased, it was found that he could not carry the ever-increasing weight in and out, up and down the whole day; and it was decided to send a trustworthy labourer with each inspector. The district is divided into sub-districts; and a sub-district is never read by the same inspector twice consecutively. A good check is thus obtained on the accuracy of the readings. The same system is adopted in reading the ordinary meters, and is a useful check on the meter reading. In addition to reading the indices and collecting the coppers, the inspectors enter the amounts they have collected in the cash-book provided for that purpose; and pay the money into the bank, after packing it into 10s. packets. A separate rental-book is kept for prepayment meters, ruled to enable index of meter, gas consumed, money received, and date of collection to

be shown. The indices and money collected are posted in the rental-book daily during the time of collection, and checked with the cash-book. Each inspector reads about fifty prepayment meters per day, enters the money in the cash-book, packets and banks his cash, and sees the amounts posted in the rental-book. In the majority of cases, a collection once during the quarter is sufficient; but we have a few which require a bi-quarterly collection, and a few which are collected monthly.

The real point of interest is, of course, does it pay? In our case, it has done so. During the year ended June 30, 1894, the average number of prepayment meters at work for the whole year was 567, consisting of 424 2-light and 143 3-light; and the total quantity of gas registered was 4,714,000 cubic feet. This quantity of gas, at 2s. 9d. per 1000 cubic feet (the price during that year to ordinary consumers), would be £648 3s. 6d.; and the actual amount received was £772 17s. 1d. The difference between the two amounts is £124 13s. 7d., which represents the meter-rent, or, in other words, the interest on the amount of capital required to fix this number of meters. Owing to the peculiarities of the district, the cost of service laying is above the average. Our average cost for laying a service for a 2-light or 3-light meter is 14s. 4½d. This sum includes the main-cock and fixing of meter. A 2-light prepayment meter costs £1 19s., and a 3-light one £2 2s. 11d.; so that supposing each prepayment meter requires a new service, the capital invested is, respectively, for a 2-light meter £2 13s. 4½d., and for a 3-light one £2 17s. 3½d.

During the year ended June 30, 1894, the average number of prepayment meters in use was 424 2-light and 143 3-light, which, on the above basis, would represent a capital charge of £1541 3s. 8d.; and the sum available for interest on this investment was, as already shown, £124 13s. 7d., or 8 per cent. During the year ended June 30, 1895, the average number of prepayment meters in use for the preceding twelve months was 1062—viz., 859 2-light, and 203 3-light, which, on the same basis as before, represents a capital charge of £2873 19s. 3d. The quantity of gas registered was 9,365,100 cubic feet, which, at 2s. 6d. per 1000 cubic feet (the price charged to ordinary consumers during that year), would amount to £1170 12s. 9d. The actual amount received, however, was £1452 15s. 6d.; leaving a balance of £282 2s. 9d. for meter-rent, or an interest on investment of 9·8 per cent.

The capital charges given above assume that a new service has been laid for each prepayment meter. This, however, does not follow. Most of us no doubt have a large number of houses in our districts where services have been laid, and gas used and then discontinued; and the prepayment meter often induces the re-use of these services. In this respect, the following table may be interesting:—

Year Ended June 30.	Total Number of Ordinary Meters Fixed on June 30.	Total Number of Prepayment Meters Fixed on June 30.	Total Increase in Number of Meters During Year.	New Services Laid During Year.
1885	5185	..	..	..
1886	5189	..	4	206
1887	5198	..	9	210
1888	5226	..	28	173
1889	5295	..	69	182
1890	5384	..	89	194
1891	5506	..	122	191
1892	5638	..	132	206
1893	5587	195	144	236
1894	5509	940	667	401
1895	5837	1184	572	434

In seven years prior to the introduction of prepayment meters, although 1362 new services were laid—an average of 194 per annum—the increase of consumers was only 453, or an average of 64 per annum. But in three years since their introduction, the increase in the number of consumers has been 1383—an average of 461 per annum; while the services have increased 1071—an average of 357 per annum. It may, therefore, fairly be claimed that the use of prepayment meters is assisting us in developing capital which has already been expended, but has become unproductive.

The average consumption per prepayment meter was, in 1894, 8666 cubic feet; and in 1895, 8818 cubic feet, which is a little in excess of the amount used by the ordinary consumer.

The paper led to considerable discussion, which will be reported in next week's issue.

Mr. MEIKLEJOHN said it was becoming that they should pass a hearty vote of thanks to the authors of the papers. The subject dealt with by Mr. Tew was not a very large one; but it was one that might appeal to any gas manager under similar circumstances, and so it was well worthy of being brought before the Association. Mr. Young's paper was of an extremely valuable character, as not only would it be of help to those who had the prepayment system in use, but it would be of great assistance to those who had not yet risen to this height in the supply of gas. They were much indebted to both gentlemen, especially to Mr. Tew, who had voluntarily offered his paper.

Mr. W. NORTH (Stourbridge) seconded the motion.

The VICE-PRESIDENT, in supporting it, remarked that there was one thing in Mr. Young's paper that had been overlooked in the discussion. He said: "The gas and money are made to agree; and the balance is handed to the consumer, who, as a rule, seems very pleased to receive it. In the majority of cases, the balance is at once replaced in the meter; a corresponding quantity of gas being turned on." That was a very cautious proceeding. (Laughter.) They were very much obliged to Mr. Young for his valuable information. It was a "burning" question for gas managers; and there was no doubt the system was well worth trying.

Mr. YOUNG briefly acknowledged the vote.

ELECTION OF OFFICERS.

Mr. P. SIMPSON (Rugby) said it was his privilege to propose that Mr. Cooper be elected President for next year. Many of the members had known him since the formation of the Association; and they all knew of the deep interest he had taken in it He hoped Mr. Cooper would be able to fill the office to his own satisfaction, and then he (Mr. Simpson) was certain it would be to theirs. Such a worthy member deserved to be placed in the highest position it was in their power to put him in.

Mr. J. C. BELTON (Willenhall) seconded the nomination, and cordially endorsed the remarks made by Mr. Simpson.

The proposition was carried unanimously.

The PRESIDENT-ELECT said he appreciated very highly the honour the members had conferred upon him; and he sincerely hoped that he should be able to discharge the duties in the manner Mr. Simpson wished. It would be his earnest endeavour to see that the Association did not suffer at his hands. If he could not tell the members of things that were new, perhaps he would be able to remind them of some things that were old. He would promise that his best efforts should be put forth to merit the honour they had bestowed upon him, and to give them satisfaction during his term of office. Continuing, he said he had to submit the name of Mr. Alfred Colson, of Leicester, for the position of Vice-President during the ensuing year. The members all knew of the kindness, indulgence, and willingness of Mr. Colson at all times to do anything he could to make their meetings pleasant and instructive; and he did not think they could have found a more suitable man for the office.

The HON. SECRETARY seconded the motion, which was unanimously passed.

Mr. NORTH proposed that Mr. Simpson be re-appointed Treasurer.

Mr. BELTON seconded, remarking that the members would all feel proud in having Mr. Simpson in that capacity so long as he was willing to hold office.

The PRESIDENT-ELECT supported the proposition; and observed that it was a long time since he first met Mr. Simpson. It was in the early days of the British Association of Gas Managers; and he believed Mr. Simpson was present at the first meeting of that Association, which was held in Birmingham, under the presidency of Mr. T. Hawksley.

Mr. SIMPSON having acknowledged the confidence of the members,

The PRESIDENT-ELECT said he had great pleasure in moving that Mr. Meiklejohn be re-elected Secretary of the Association. He (Mr. Cooper) had passed through the office of Secretary; and he knew somewhat of the duties appertaining thereto. It was a matter of great anxiety to the Secretary to know how to maintain the interest in the meetings; but he did not think they could find a year during the time Mr. Meiklejohn had held the office when he had failed in his work. He would couple with the motion the hearty thanks of the members for the indefatigable manner in which their Secretary performed his duties.

Mr. YOUNG seconded the motion; and it was cordially agreed to.

The SECRETARY expressed his appreciation of the kind words which had fallen from Mr. Cooper, and the hearty manner in which the members had endorsed them. He should be happy to do all he could to further the work of the Association.

On the motion of Mr. V. HUGHES (Tipton), seconded by Mr. W. W. HULSE (Longton), Messrs. W. Parlby and S. Meunier were elected members of the Committee.

Mr. W. WINSTANLEY (Newcastle-under-Lyme) moved the appointment of Messrs. F. W. Cross and T. Glover as Auditors. This was seconded by Mr. F. H. DARWIN (Fenton), and carried.

THANKS TO THE RETIRING PRESIDENT.

Mr. NORTH moved that the best thanks of the members be given to the retiring President (Mr. G. Winstanley), who had done all in his power to make his year of office a success. He (Mr. North) was unavoidably deprived of the pleasure of visiting the Coventry Gas-Works with the members in May; but he was sure they all fully appreciated the kind treatment they received from their President on that occasion. Mr. Winstanley had made his mark in the gas world. He had been a successful Engineer and Manager; and they had been very proud to have him as President.

Mr. SIMPSON, in seconding the proposition, said they all knew of Mr. Winstanley's retiring disposition, and that they had some little difficulty in getting him to understand that he was the proper man for the position. Now he (Mr. Simpson) thought Mr. Winstanley would be persuaded that he was occupying his right place when President. They had had few Presidents who had excelled Mr. Winstanley's efforts to keep the Association at the pitch at which they liked to see it; and therefore he deserved their best thanks.

The PRESIDENT-ELECT, supporting the motion, spoke of the

readiness with which Mr. Winstanley always imparted to his professional brethren any knowledge or information of which he might be in possession. His year of office had been one of profit and pleasure.

The motion was unanimously adopted.

This concluded the business; but, before separating, the members took tea together.

RECENT DISCOVERIES RELATING TO GAS LIGHTING.

We have received from Dr. H. Bunte, of Carlsruhe, a copy of his paper on the above subject, which was read before the meeting of the German Association of Gas and Water Engineers at Cologne this year. The following is a *résumé* of it.

A series of important discoveries bearing directly or indirectly on gas lighting, marked the progress of scientific work during the last few months. We may single out for detailed consideration the discovery of a new element in the air, the industrial production of acetylene, the discovery of larger quantities of the rare earths, and the synthetical production of illuminating gas by means of benzol. These four subjects will be dealt with in turn in this review of the scientific advances of the year.

Argon.

The news of the discovery, by two English scientists, of a new gas in the air, was brought to the Continent about a year ago. Since air is essential to gas-flames, the news was especially interesting to those engaged in the lighting industries. The report was received with much scepticism, for of all bodies the air had been most thoroughly investigated by scientific men. Nevertheless, the extraordinary inertness of the new element—surpassing even that of nitrogen—was found accountable for its tardy discovery; and the name "argon" (from *α·εργον*) was appropriately given to it. In all former analyses, argon had escaped notice, by reason of the inert residue remaining after the usual absorptions and reactions had been carried out being uniformly classed as nitrogen. But if the nitrogen is absorbed from this residue by means of red hot magnesium or lithium, there remains a small quantity of residual gas, which defies absorption, and has a characteristic spectrum distinct from that of nitrogen. Such a residue is not found with chemically prepared nitrogen. The residual gas, which is argon, amounts to almost one per cent. of the air, and may further be distinguished, and eventually separated, from nitrogen by reason of its greater solubility in water. The suggestion that argon is a modification of nitrogen—as ozone is of oxygen—has not been substantiated; and it must therefore be regarded as a new element. What part the new gas plays in the phenomena of combustion and of luminous flames, we cannot say at present; but even if it has a solely negative influence, it must be of interest to us as an element of highly remarkable properties. Though forming only a small percentage of the atmosphere, the total quantity of argon on the globe is enormous; and only the difficulty of isolating it makes it a costly substance.

We may next inquire if this element occurs in terrestrial bodies other than the air. Oxygen forms a very important constituent of the crust of the earth. Nitrogen, on the other hand, is absent in the primitive rocks, and is found only in the later formations which owe their existence to organic life—such as coal, &c. It was found that some rare minerals belonging to the pitch-blende group, on treatment with acids or heating, gave off a gas which resembled nitrogen in inertness. On examining this gas anew, it was discovered to consist chiefly of nitrogen and argon; but it also contained other gases, which, on spectroscopic investigation, proved identical with elements observed in the sun's photosphere, and in Orion. In the mineral clevite especially, it is believed that an element peculiar to the sun's photosphere, known as "helium," has been discovered. These discoveries are still so recent, that it is impossible yet to say whether these elements may play an active *rôle* in the phenomena of combustion.

Thorium Oxide.

The so-called rare earths which play so important a part in the mantles of incandescent gas-lights, were ten years ago merely scientific curiosities. Though large quantities are now used, the prices of the extracted earths and their metallic bases are still extremely high, mainly on account of the difficulty of extraction. About the end of the last, and the beginning of this, century a great number of the rare earths were first discovered in certain Swedish and Norwegian minerals. Chief among them were the oxides of cerium, lanthanum, didymium, zirconium, yttrium, and thorium. Though the extraordinary power possessed by these earths of emitting light on heating was observed in the first instance by the discoverer, by means of the blowpipe flame, little interest was taken in them, until Auer von Welsbach utilized them for lighting purposes. They have now been found tolerably widely disseminated; and mineralogists and chemists, especially in America, have carefully examined minerals in which thoria and the allied earths are but minor ingredients. Great quantities of monazite, a phosphate of cerium and lanthanum, containing 2 to 4 per cent. of thorium, have been discovered in the United States, Brazil, the Ural, and Australia. Some idea of the quantities now dealt in, may be gathered from the fact that an Amsterdam firm undertake to deliver yearly 20,000 tons of Carolina monazite sand on rail at 9 cents per pound.

The consideration then arises whether the rare earths—particularly thorium oxide—occur in such quantities as to perpetually provide the thousands of mantles needed; and, secondly, whether the high price of the mantles is due to the rarity of the earths, or whether it may not soon be lowered. A calculation, based on the figure quoted above, may serve to elucidate these questions; but the figures have no absolute value, and are only illustrative. The monazite sand will contain on the average about 3 per cent. of its valuable constituent, thorium oxide; and at 9 cents. = 4·5d. per pound = 453 grams, one gram of the thorium oxide in the raw material will be bought at about 0·33 penny, or, as a mantle contains about half a gram of the oxide, the quantity required for each mantle would be worth about 0·165d. Now, if we take account of the difficulty of working up the mineral and purifying the thorium nitrate, and the professional skill requisite, we shall come to the conclusion that the very high price of the mantles is in no degree influenced by the costliness of the raw material; and we may further surmise that they cannot be produced very much more cheaply in future, without sacrificing quality or unduly cutting the manufacturers' profits. With regard to the permanence and sufficiency of the supply, let us take only the one offer of 20,000 tons of monazite sand from Carolina, containing about 3 per cent. of thoria. For the present, we will disregard the rich supplies in Australia, Brazil, the Ural, and Sweden, and therefore are not likely to overestimate the quantity of the earth available. In the 20,000 tons of monazites and, there are 600 tons of thorium oxide, or 600 million grams of the earth which is the basis of the mantles. As each mantle contains half a gram of thorium oxide, we are able, with the above quantity, to impregnate 1200 million mantles annually.

The natural control of price exercised by supply and demand and free competition, will soon bring about more healthy conditions; and incandescent gas lighting will attain its proper scope. Competition, also, will bring about improvements in both burners and mantles; and the light will be adapted to meet various ends. For instance, the present lights are of from 40 to 60 candle power for a consumption of about 3½ cubic feet per hour; but for small rooms, a poorer light—say, of 20 candles—would suffice, and with a smaller consumption would, with penny-in-the-slot meters, bring gas lighting within the reach of the poorest, and make them independent of petroleum. Moreover, spirit and benzine or naphtha incandescent lamps have recently been made. The spirit is drawn up by a wick, and vaporized by means of a small auxiliary spirit-flame. The vapour passes to a Bunsen burner, and is consumed to heat the mantle, in the same way as gas in the incandescent gaslight. The spirit-lamp gives a light of nearly 20 candles, for an hourly consumption of 1000 grains of alcohol (96 per cent.), which, with spirit which has not paid duty, would cost about 0·3d. The incandescent spirit-lamp will, when improved, undoubtedly enter into competition with petroleum lamps for use in country places. Similar to the spirit-lamp is the incandescent naphtha lamp, in which petroleum spirit is gasified by an auxiliary flame, and consumed in a Bunsen burner. This burner also has many remediable defects; but it undoubtedly has a future before it, though it will not seriously compete in districts supplied with gas.

Acetylene.

The news reached us at the end of last year that calcium carbide—which had earlier been prepared by Wöhler by a circuitous process—had, by means of the electric furnace, been produced in America in a simple and cheap way. A short time earlier, Moissan had drawn attention to the fact that both calcium carbide and aluminium carbide were decomposed by water with the liberation of a gas, which with the former proved to be acetylene, and with the latter methane. The importance of the American announcement lay in the extraordinary cheapness of production which was claimed for the new process. Water power had been utilized for producing the current; and at the cost announced, it appeared as though a formidable rival of illuminating gas was about to make its advent. The first claims have not been quite established; but the electrochemical works at Neuhausen and Bitterfeld have taken up the manufacture, and calcium carbide is now to be bought at a price of 2¾d. per lb. The calcium carbide, being easily decomposed by the moisture of the air, is packed in sealed metal boxes holding from 10 to 20 lbs. Aluminium carbide, on the other hand, is not easily decomposed, and comes on to the market in powder without any special packing.

Regarding calcium carbide as a raw material for producing illuminating gas commercially, we must consider the purity of the carbide we have available. The commercial article is not pure, but contains only from 50 to 65 per cent. pure calcium carbide. The yield of acetylene accordingly falls considerably below the theoretical, which has generally been taken as the basis in calculations of the cost of producing the gas. The amount of pure carbide in the commercial product may be ascertained by decomposing a weighed amount with water, collecting the gas evolved, and measuring it. A correction must be made for the solubility of the gas in the confining water; or the volume of gas evolved may be found by measuring the amount of air it displaces from a large flask in which it is produced.

Acetylene gas burns like rich oil gas, with a very luminous flame. A characteristic of the acetylene flame is the almost total absence of the blue core; consequently the illuminating part of the flame extends down almost to the burner. The source of this peculiarity lies in the fact that this gas without combustion is decomposed by heat, with development of heat, and the separated carbon is raised by the heat so liberated to incandescence. This remarkable property of acetylene gas forms the basis of Lewes's theory of the formation of luminous flames, which at first sight appears very clever; but as it is not sufficiently established in some respects, it must not be used as the starting point for further inferences. The relative ease with which acetylene is condensed to the liquid state renders it available for distribution in this form, in cast-iron cylinders, which serve to supply the gas for lighting purposes, merely with the interposition of a reducing valve. It therefore appears that, notwithstanding its relatively high price, acetylene will take its place among illuminating agents. For raising the illuminating power of gas, acetylene possesses the advantage over most carburetting agents of not being deposited from the gas even under the influence of considerable cold. Its price, however, is prohibitive for ordinary enrichment in this climate, where the vapour of liquid hydrocarbons can be used without appreciable separation taking place.

Carburetting with Benzol.

Three years ago, at the Kiel meeting, attention was first drawn to benzol as the natural carburetting material for coal gas. At the prices then obtaining, it was also the cheapest. Apart from this, the synthetic production of illuminating gas by the aid of benzol would give a wider choice of coal, and permit the use of large carbonizing chambers. The experiences already gained at Munich, Dessau, Hanau, and elsewhere prove that, with apparatus for the purpose, carburetting with benzol may be safely introduced at any works where it is desired to raise the illuminating power of coal gas. The Munich works have for some time used benzol for carburetting; and Dr. Schilling writes thus with reference to it:—

> At one works all the carburetting has been done with benzol during the winter to the exclusion of the use of cannel, while at the other works benzol has been used whenever the supply sufficed. In the coming year our requirements in enriching material will be wholly met by benzol, which will be solely used at both works. Considerable economy in working has been effected by its use. Before the close of the working year, it is not possible to give exact figures; but the financial gain has taken place in three directions—(1) By a cheaper supply of carburetting material than the cannel hitherto used, (2) by increasing the yield of gas from the coal, and (3) by the addition of 1 per cent. of air to the gas before the oxide purifiers. It is to be remarked that many works which have to get cannel from a distance, would at present prices find benzol the cheaper enriching material; and a considerable rise in price of the latter need scarcely be feared, as the German benzol market would be held in check by the competition of the coal market, as well as of the English benzol market. The coal was carbonized at much higher temperatures, and a higher make of gas obtained; while the small decrease in the illuminating power of the gas was readily made up by benzol. The decreased illuminating power caused by adding 1 per cent. of air to assist purification, was also made up by benzol and more economical purification thus effected; while the air went to increase the volume of the gas. The latest form of the apparatus has only been in use a short time; but it has worked without the least difficulty. It is heated by exhaust steam only, to about 25° C.; and then 21½ lbs. of benzol are vaporized per hour, and suffice for the hourly make of about 31,800 cubic feet of gas, of which only 9500 cubic feet pass through the apparatus to subsequently mix with the rest of the gas. With the apparatus quite cold, about 7¼ lbs. of benzol are vaporized hourly; while by the use of live steam, the quantity can be enormously increased. For example, at 48° C., 108 lbs. of benzol are carried away by the gas every hour—a quantity sufficient to carburet an hourly make of about 170,000 cubic feet—and even then the full capacity of the apparatus is not utilized. At the end of this year, more detailed reports and figures will be published.

To these remarks of Dr. Schilling, may be added, in conclusion, a word on the different ways in which the carburetting may be effected. Measured quantities of benzol may be sprayed directly into the stream of gas, or benzol vapour may be supplied to the whole or a part of the stream, the part subsequently mingling with the main stream. One point, however, must always be regarded—viz., the quality of the benzol. The 50 per cent. benzol of commerce contains too much of the high boiling constituents, toluol and its homologues; and leaves considerable residue, and is easily thrown down from the gas. On the other hand, the 90 per cent. benzol is generally as cheap as the 50 per cent., and is by far the most suitable material. The quality may be readily checked by a simple distillation test.

The Future of Acetylene.—According to the *Electrical Engineer* of New York, the pioneers of electrically produced acetylene are abandoning the problem of utilizing it for the enrichment of gas, and are actively engaged in demonstrating that it may be employed to more advantage in cheapening the manufacture of innumerable substances which are used in the arts, but which, up to the present, have been matters of pure chemistry. In this direction, it is said, "the latest production of the electrical furnace has a utility out of all proportion greater than that which can be derived from its peculiar light-giving powers."

THE RECOVERY OF BYE-PRODUCTS FROM PRODUCER GAS.

The above subject has lately been dealt with by Mr. A. Gillespie in a contribution which appears in the *Journal* of the West of Scotland Iron and Steel Institute.

Having succeeded, to a certain extent, in the recovery of tar and ammonia from blast-furnace gases, the author was invited by a glass manufacturing company to direct his attention to the possibility of obtaining like results from producer gas, and especially in connection with a series of producers developing gas for a glass bottle furnace. He was aware that attempts had been made to recover such bye-products after the gas had done its work in the melting-furnace, and that these attempts had necessarily failed, for the products were never recovered, and were no doubt destroyed in the intense heat of the furnace. The question was simply whether or not the gas could be intercepted between the producer and the furnace, robbed of its tar and ammonia, and passed on to the furnace in a condition fit for its main purpose. The author gives the following account of his investigations: Two difficulties presented themselves. The temperature of the gas, as it leaves the producer, is from 800° to 1000° Fahr. This must be reduced to considerably less than 100° Fahr. for the recovery of ammonia. The reduction of temperature is, therefore, in the first place, a loss of useful heat to the furnace; and, secondly, the removal of the bye-products may so reduce the potential energy as to render the gas unfit for its main purpose. The first difficulty is not a serious one, for the initial loss of temperature can be easily restored if the melting furnace is constructed on the regenerative principle. As to the second, and more serious, difficulty—the probable loss of heat energy, by the removal of the bye-products—I felt somewhat uncertain; my knowledge of the subject being mechanical rather than chemical. But if those who are familiar with the chemistry of producer gas can assure us that loss of heat by the removal of the tar compounds is not so great as to imperil the efficiency of the gas for fulfilling its chief function, I shall be satisfied if I can, with the assistance of this explanation, indicate how the bye-products can best be secured. Assuming for argument that it is only a question of proper appliances, in the right place, that is to put us in possession of profitable results, we shall endeavour to ascertain first what it is we may obtain, and then how we are going to get it. The recovery of what are termed bye-products from coal in connection with the manufacture of illuminating gas, has been in common practice for many years, though some of us can remember when they were called "nuisances," and the gas makers were at their wits' end to get rid of them. Their recovery from coal used in blast-furnaces is not a matter of ancient history.

In the carbonization of the coal for illuminating purposes, there is obtained in close retorts about 10,000 cubic feet of gas per ton; and for the removal of impurities, or bye-products, the gas engineer has only to concern himself with this volume. But in the case of blast-furnaces or gas-producers, this volume is enormously increased by the air sent into the furnaces by the blowing-engines or following the steam-jets in the producer; so that, instead of 10,000 cubic feet per ton of coal, the engineer has to deal with 130,000 cubic feet, or thirteen times the volume of the other. Like the search for the precious metals in quartz rock, the 10,000 cubic feet of profitable gas can only be recovered by dealing with the entire volume, which must be cooled and washed—with this difference, that, though the quartz may be of no further use, the mixture of gas and air, cleared of its tar and ammonia, is just in the right state for giving out its energy as a heating agent.

Having no immediate concern with the heating properties, let us inquire what else we may get out of this enormous body of gas. There are two main ingredients—tar and ammonia—varying in quantity according to the nature of the coal. The quantities recovered from the blast-furnace gases range from about 150 to 170 lbs. of tar per ton of coal, and about 5 to 6 lbs. of ammonia. The tar yields by distillation about 80 to 90 lbs. of pitch, and 6½ to 7½ gallons of pitch oil; while the ammoniacal liquor, when treated in the sulphate stills and saturators, is converted into from 20 to 24 lbs. of sulphate per ton of coal, containing about 24 per cent. of pure ammonia. Thus, from a blast-furnace consuming 75 tons of coal per 24 hours, there will be obtained about 2¾ tons of pitch, 825 gallons of oil, and 14¾ cwt. of sulphate of ammonia, which, at present market rates, would yield £15. If we may take it for granted that, in the 130,000 feet of gas coming from a producer, there are the same ingredients in similar proportions to those we know are not blast-furnace gas—and I am not aware that there is any essential difference in the conditions—then it becomes a question how they are to be recovered with the least possible injury to the heating energy of the gas.

This brings us to the second branch of the inquiry: How is it to be done? The dimensions of the apparatus must be regulated by the number and capacity of the producers. Upon a system of six producers, each consuming 10 tons of coal per 24 hours, the result, in proportion to what has already been stated, would be about 2¼ tons of pitch, 420 gallons of oil, and 11¼ cwt. of sulphate of ammonia, the total value of which, at current market prices, would be about £12 per 24 hours. The main element of expense in this result is for sulphuric acid, of

which 18 cwt. are required to precipitate each ton of sulphate. Thus, 20s. worth of sulphuric acid will produce 1 ton of sulphate of ammonia. The temperature of the gas will fall rapidly after leaving the producer, till it may be expected to enter the first vessel—the "tar-washer," which also acts as a collecting-main—at about 400° Fahr. The gas from each producer enters the washer by a separate branch, so that each of the six may be isolated for any purpose. The gas is there broken up into thin streams by a serpentine diaphragm, with serrated edges. The lower, or serrated edge of the diaphragm is sealed in water, which is immediately displaced by the tar as it is deposited from the gas. It has been found preferable to feed the washer with tar obtained farther on in the process, with the double object of so far drying the tar by exposure with the hot gas, and at the same time entangling the tarry particles from the gas as it passes through the serrations. The gas is forced in this vessel from most of the heavier tars, which fall on the sloping bottom, and are drawn off by cocks as required, and the seal kept up in the diaphragm by the addition of fresh tar.

In the tar-washer, the gas is reduced in temperature to about 200° Fahr., and passes by separate branches to a collecting-main of a diameter sufficient to contain the volume from the six producers, and corresponding in length to the condenser-boxes. The condensers consist of a series of four boxes, made up in sections for convenience in construction; each box having 27 pairs of 8-inch diameter steel pipes, about 30 feet high. The boxes are fitted with serpentine diaphragms, serrated on the lower edge, and sealed in liquor. The gas passes from the collecting-main by 27 vertical branch pipes (8-inch), which are connected at the top to the first row of condenser-pipes. The gas descending to the box must pass through the sealed diaphragm before escaping up the other row of vertical pipes. In this process, the gas is washed in the cool liquid—depositing a portion of its tar and ammoniacal liquor; and the temperature is reduced by contact with the liquor and exposure to the atmosphere in the small vertical pipes.

The serpentine form of the diaphragm is adopted to increase the washing area, and enable the gas to be more thoroughly in contact with the liquor than if the mere edge of the 8-inch pipe were so sealed. The gas passes up the second row of pipes to the top—crossing then to the top of the first row of pipes in the second condenser-box, where the process is repeated; then in a similar manner, passing through the third and fourth boxes, when it may be assumed that the temperature has been brought down to about 70° Fahr., or lower, and that, in the repeated washings, the last traces of ammonia have been practically removed.

To facilitate this, and in order to strengthen the liquor as far as possible, the boxes are arranged on a graduated level; the fourth box being the highest, and the first the lowest. Clean cold water is fed continuously into the fourth box, and the level of the seal maintained at the required depth by an adjustable run-off valve and syphon, whence it is carried to the box on the next level, which is thus fed continuously with the weak liquor obtained from the fourth. The stronger liquor formed in the third is fed into the second in a similar way, and from it to the first, whence the resulting liquor is drawn off continuously for further treatment. By this process the gas becomes gradually cooler; depositing light tar, which, along with the ammonia, is carried off in the liquor, while the repeated contact with the gas in the sealed diaphragms, absorbing more ammonia in each washing, so strengthens the liquor that it is made fit for profitable treatment in the sulphate-still.

The tar and ammoniacal liquor come away together. The latter enters at the top, and spreads over the first tray to a given depth, sealing the serrated edges of the cups. The liquor overflows at the required level, and descends to the next tray; sealing the cups on it in the same way, and so down to the bottom tray. Steam at about 20 lbs. pressure per square inch is introduced under the bottom tray, and immediately ascends through the nozzles, where it encounters the liquor; and it can only escape by passing a special vessel, where the products are automatically separated according to their different specific gravities, and pass into separate store-tanks.

As the gas will not pass through water except under pressure corresponding to the depth of the seal, and as it is also desirable that no pressure of gas should be allowed to accumulate in the producer, it is necessary to provide mechanical means for drawing forward the gas by forming a vacuum. This is most conveniently effected by an exhauster, of any of the well-known forms. One or more exhausters are placed near, and connected to, the last row of condenser-pipes, and so regulated that there will be no back pressure in the producers, and just enough forward pressure on the outlet side of the exhausters to suffice for sending on the clean gas to the melting-furnace. The regulation is effected by self-acting valves, which are adjusted to the required uniform pressure. The gas, now freed from the bye-products, is passed on to the melting-furnace.

Our immediate interest is in what has been recovered. The tar contains a large percentage of water, which must be distilled off before the tar can be put on the market. For this purpose, the tar is forced, by a pump or an air-compressor, into an elevated tank, whence the tar gravitates into an ordinary still, which, in the case of blast-furnace tar, is fired by the clean gas. The feed being shut off, the charge is evaporated, and cooled through a worm condenser. When the water has been driven off, the oil, which follows, is passed into receivers, and sold for such purposes as the Lucigen and Wells lights, oil fuel for steamers, &c. When the oil has been run off, the residue (pitch) is passed into a cylindrical cooler, until the temperature is so far reduced that it is safe to run the pitch into open ponds, where in a few hours it hardens, and is then broken up and sold. For certain purposes, the pitch may be required of a softer consistency. This may be obtained by running it off with the oil in it. It is then sold as boiled tar. The other product—the ammoniacal liquor—after being separated from the tar, is also sent into an elevated charging-tank, whence it is fed into a sulphate-still. These are of various forms; but they all treat the liquor in the same manner.

The bye-products having been recovered and disposed of, there need be little anxiety as to the demand for them. Apart from the efficiency of oil as a lighting agent for large areas, if a sufficient supply could be guaranteed, there would doubtless be a constant demand for oil as a fuel. Pitch has maintained a ready sale; while the use of sulphate of ammonia as a fertilizer gains daily in favour.

DIMENSIONS OF GAS-WORKS PLANT.

The above subject has lately been dealt with by Herr Reissner, the Manager of the Berlin Municipal Gas-Works, in the *Journal für Gasbeleuchtung;* and an abstract translation of the article has been given in the Society of Chemical Industry's *Journal*. After many years' experience, the author has laid down the following rules, which have been adopted in the several works under his charge. For estimating the dimensions of the apparatus, the maximum gas production of a day in the month of December is taken, and the so-called normal dimensions calculated therefrom.

Retorts.—With Silesian coal, 15 per cent. of retorts in reserve; but if in any one of the four or five works some benches are unavailable for one whole winter, in consequence of rebuilding, &c., then a reserve of 10 per cent. may, as an exception, be regarded as sufficient.

Condensers.—A minimum of 3·65 square feet of cooling surface per 1000 cubic feet of gas per 24 hours; or, for completely furnished works, 4·56 square feet of cooling surface per 1000 cubic feet of gas. The Berlin form of condenser is a cylinder 4·26 feet diameter and 28·86 feet high, with eleven internal cooling-tubes, 4 inches in diameter; the outer surface, together with the connecting-pipe to the adjoining cylinder, having very nearly the same air-cooling surface as the water-cooling surface of the inner pipes.

Scrubbers.—These are filled with boards. A minimum of 5 cubic feet capacity per 1000 cubic feet of gas per 24 hours; and for completely furnished works, 6 cubic feet.

Exhausters.—One exhauster in reserve at each works.

Purifiers.—Five trays with oxide of iron in each, 1·17 square feet of area per 1000 cubic feet of gas per 24 hours. Where there are four purifiers, all are included in the calculation. In cases of necessity, for a single winter, and with tolerably fresh purifying material, 1 square foot area per 1000 cubic feet of gas will suffice.

Catch Purifier.—With four to six trays of sawdust, there should be one catch purifier to each four oxide purifiers, and of the same dimensions.

Station Meters.—A maximum of 80 revolutions of the drum per hour. On account of unavoidable irregularities in production, the maximum quantity of gas passing per hour should be estimated at 10 per cent. above the average hourly production.

Gasholders.—A minimum of 80 per cent. of the greatest daily production. In Berlin it is at times difficult, with this minimum, to keep all retorts regularly charged. This is especially the case on Mondays.

Works Connections.—Outlet main from five beds of nine retorts in each, 12·5 inches in diameter. From the point where the mains from the retorts unite into large mains, the latter in Berlin are 37·4, 39, and 39·37 inches in diameter, giving an estimated velocity of 9·84 feet to the gas. With smaller mains, the velocity should be between 6·56 and 9·84 feet.

Cross Connections between two mains on the same works may have a velocity for the gas not exceeding 12 feet. For the outlet main from the works to the town, it is estimated that in Berlin there is a loss of pressure in the large mains of 1 inch in 2734 to 3280 yards length of main, with the greatest hourly output on a maximum December day; and this maximum output is about one-eighth of that of 24 hours.

Incandescent Gas Lighting for Roads.—The question of the better lighting of the roads has lately been occupying the attention of the Fulham Vestry; and at the meeting of this body last week, a proposal was submitted for adopting incandescent gas-lights for a section of the Fulham Road, by way of experiment. The members were evenly divided on the question; but the casting vote of the Chairman (Rev. J. S. Sinclair) was in favour of trying the new system.

REGISTER OF PATENTS.

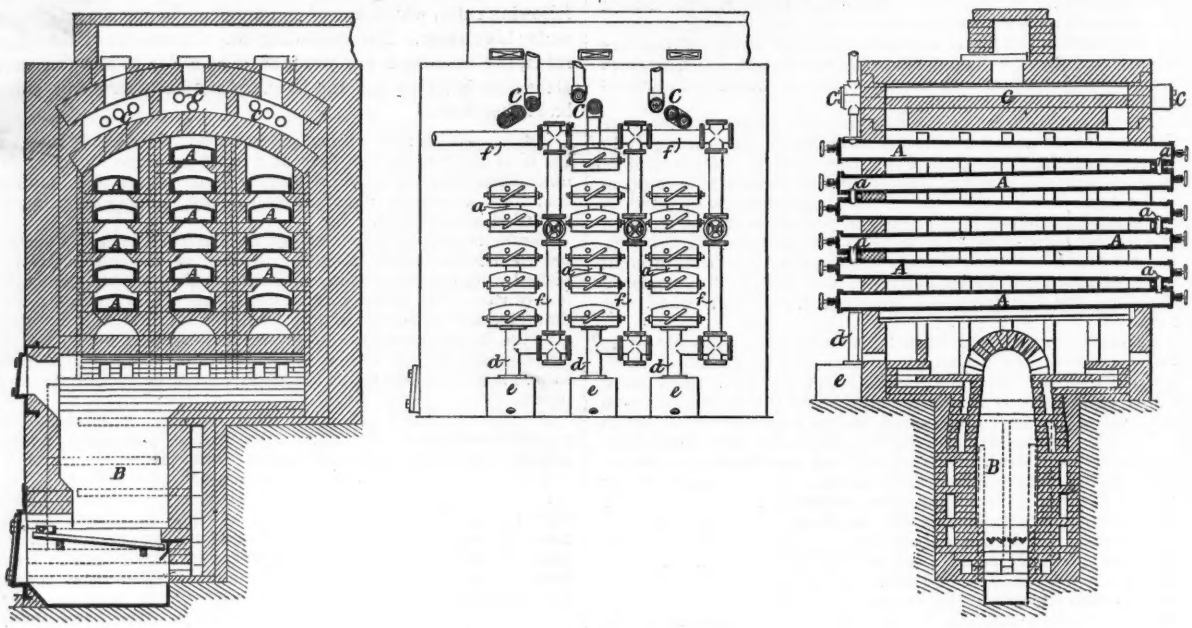
Gas-Generating Plant.—Thwaite, B. H., of Finsbury Pavement, E.C. No. 18,445; Sept. 29, 1894.

In the course of his specification relating to this invention, the patentee says: In the gas-generator vessel, the expedient adopted to ensure the approach of the air to the fuel, is to provide at the base of an inverted cone casting (which partly acts as a support to the refractory lining, and also as a means of reducing the area of ingress to the fuel) cast-iron lugs, that act as a means of suspension and support for a series of bars—of steel or wrought iron—which project below the level of the inverted cone almost into the water of the hydraulic bath. Such bars may, however, project below the inverted cone, not quite to the level of the water, forming a barred grill or girdle that retains the fuel in a vertical column down to, or near to, the level of the water-bath. This barred girdle enables the air to approach and enter all round the base of the column of fuel; and there is thus no danger that the accumulation of fuel becomes such as to obstruct the passage of air through the fuel.

The refractory lining of the generating vessel is of special construction. Instead of using ordinary fire bricks or blocks, fire-clay pipes are employed, smaller in diameter than the iron casing; and the space between them is filled in with a grouting of fire-clay, which, by the heat of the fuel, is baked into a hard condition. When a fan air-blast is used, the patentee prefers to lead the air (after it has passed through a special tubular air-heating apparatus, heated by the passage through it of the products of combustion from the gas-engine) into a jacket surrounding the generator, by which the air is further heated before it enters into the base of the fuel in the generator. By these means, part of the sensible heat of the gas-engine exhaust gases and the heat radiated from the side of the generator vessel is recovered.

For the purpose of catching the unvolatilized hydrocarbons that pass over with the gases from single-vessel generators, the patentee arranges to provide for these vessels a secondary chamber (which may serve for more than one gas-generator) in its general form an almost exact imitation of the gas-generator vessel—that is to say, like the latter or gas-generator vessel, it is provided with a hydraulic bath, and may or may not have a grate to support coal or coke on the solid bottom of the hydraulic bath. The inclination of the conical base of the coal or coke column forms a space by which the air can enter into the base or lower part of the fuel. This secondary chamber is connected to the generator by means of refractory lining conduits connecting the upper parts of the two vessels. It is filled with coke of uniform size; and to enable this material to be replenished in the event of its partial combustion lowering the level of the coke, an ordinary gas-generator feed-hopper is provided, by which more coke can be added at any time.

In order to be able to remove the coke as rapidly as it becomes clogged or otherwise charged with pitch, tar, or other hydrocarbons, the base of the column of coke or clinker submerged beneath the water in the hydraulic bath is being continually reduced by the removal of part of the coke; new additions being made through the feed-hopper. The coke can be raked away from the base submerged in the water of the hydraulic bath without in the least arresting the progress of gas making; nor does it involve the loss of any gas, because the side-plates of both the second chamber vessel and the gas-generator dip some distance into the water of the hydraulic bath. The outlet-gas connection from the coke chamber is at the base; so that the gas produced in the generator is compelled to permeate through the column of coke, and becomes thoroughly scrubbed. Moreover the dust and tar produced when new fuel is charged into the generator, does not obtain access to the gas mains or flues, but is caught in the coke chamber, which also serves the purpose of a down-comer leading the gas to the flues.



Treating Liquid Hydrocarbons and Producing Gas and Bye-Products therefrom.—Dvorkovitz, P., of Bishopsgate Street, London. No. 23,671; Dec. 5, 1894.

The object of this invention (in the words of the patentee) is "to provide efficient means whereby gas and valuable bye-products can be obtained from petroleum or other liquid hydrocarbons, in such a manner that practically all, or a very large percentage of, the liquid hydrocarbon constituents are obtained in the form partly of gas and in considerable part in the form of valuable liquid bye-products, which are in part of a novel character, consisting of unsaturated hydrocarbons of hitherto unknown series, and containing also benzol, toluol, xylol, and the like."

The liquid hydrocarbon is subjected to a gradual rise of temperature, which should not—the specification remarks—exceed about 1000° C., or a dull red heat. This can be effected by arranging a series of retorts so that liquid will flow down through them. For this purpose, they are preferably placed in reversely inclined positions, so that they slope alternately in opposite directions, the lower end of each of the retorts above communicating with the upper end of the retort beneath it. The series of retorts are heated by a furnace in such a way that the lowermost retort is subjected to a temperature of (or about) 1000° C., and the uppermost retort is heated to a temperature of (say) not much more than 300° C. at the most; but it may be lower—for example, as low as 150° Fahr., or lower. The retorts in the series are subjected to a temperature gradually increasing from the highest to the lowest. The oil is fed directly into the uppermost retort; but it is preferably fed first into pipes set in the brickwork or placed above the highest retort, so as to be heated by the otherwise waste heat. The oil thus admitted to the retorts is gradually vaporized, and partly gasified; and the oil and vapours and gas pass down through the upper retort and into the next, and therethrough into the next again, and so on, through the series. The products leave the last retort after being vaporized and gasified; the pipe by which they leave the last retort being the only outlet from the retorts. It dips into a catch-box for the heavier condensed matter; a rising-pipe opening from the box, and conveying the vapours and gas to a pipe which conducts them to the condensers and apparatus "where the aforesaid new and other bye-products are mostly deposited—the permanent gas passing to a gasometer, or place of utilization or storage. The bye-products so obtained are very suitable for enriching ordinary coal gas; but they can be used for the manufacture of aniline dyes, or for other purposes to which they are, or may be, applicable. By conducting the process as described, no (or but little) carbon will be formed in the retorts."

The retorts A are shown in the above engraving as being in inversely inclined positions (although, as the object of the arrangement is to allow the oil to flow down through them, they may even be horizontal). The lower end of each retort communicates with the retort next beneath it by pipes *a*. The retorts are contained in a chamber connected with a furnace B, arranged with flues or passages so that the heated products from the furnace pass upwards, and in their passage act upon the exteriors of the retorts in such manner that the lower retorts are heated to a greater degree than the upper ones; the temperature gradually increasing from the upper retort to the lower one, in the manner already stated. The retorts are preferably of considerable width, and small depth in transverse section. C are pipes contained in the upper part of the chamber above the retorts, or in a flue leading from the chamber; the pipes conducting the liquid hydrocarbon to be treated into the inlet therefor in the uppermost retort. The oil and the vapours and gas generated then pass down through the series of retorts in each tier; and the final products pass out through the pipe *d*, dipping into the catch-box *e*, which receives any heavy condensed matter. A rising-pipe *f* conveys the products "to the condensers and apparatus where the unsaturated hydrocarbons, which are a principal product of the process, are mostly deposited—the permanent gas passing to a gasometer, or place of utilization or storage."

The claims for the invention are: (1) The treatment of petroleum or other liquid hydrocarbon, by passing it through an arrangement of zig-zag retorts connected together so as to form a continuous passage, with its exterior exposed to heat throughout its length, and having an inlet for the liquid hydrocarbon at top, and an outlet only at bottom for the products of the treatment; the retorts being maintained at, or

about, the temperature already stated, so that there are produced gas and liquid bye-products of the character stated, with but a small amount of pitch, but with no coke. (2) The production of liquid unsaturated hydrocarbons of the character stated, and suitable for use in the manufacture of aniline dyes, for enriching lighting and heating gas, or for other purposes; the unsaturated hydrocarbons being produced by treating petroleum or other liquid hydrocarbon in retorts arranged as described, and subjected to (or about) the temperatures stated. (3) The arrangement and combination of parts constituting the apparatus described and shown for treating liquid hydrocarbons as, and for the purposes, described, and whether one tier or several tiers of such retorts be used in the arrangement.

Manufacture of Gas-Purifying Material.—Campbell, J. E., of Bradford, Lancs. No. 4799; March 6, 1895.

This invention relates to the preparation of an iron oxide compound primarily intended for use in the purification of coal gas in place of a preparation either of precipitated iron hydroxide, obtained from waste hydrochloric or other acid from galvanizers, wire workers, or copper smelters, or hydrated oxide of iron obtained from the waste iron or borings from aniline or other manufactures, with which a certain amount of sawdust is mixed to take up the excessive moisture, and render the mixture porous, so that the gas can readily pass through it. The patentee maintains that the use of sawdust for this purpose is objectionable "in that it, in itself, contains a large percentage of moisture; and when the material is subsequently treated to recover the sulphur, either by being calcined or used in the manufacture of cyanides or colours, a great quantity of black dust or other useless matter is left as a residuum." He also finds that a mixture of these two forms of iron oxides produces material better fitted for the purpose; and that the combination therewith of "kieselguhr" (infusorial earth), instead of sawdust, gives much better results.

Describing the mode of carrying out his invention, the patentee says: I separate or precipitate iron hydroxide from the waste hydrochloric acid (commonly known as "galvanizers' pickle") by treating it with lime, magnesia, or other suitable material—preferably lime—blowing air into the mixture while boiling, and then filtering, pressing, or the like. I also obtain hydrated iron oxide—that is, the waste iron or borings from aniline or other manufactures. I may also obtain precipitated iron oxide, by treating the waste aniline iron with hydrochloric acid and lime, magnesia, &c. I mix the precipitated and the hydrated iron oxides in about equal proportions, and add thereto a quantity of kieselguhr, infusorial earth, sawdust, or other material, sufficient to take up the excessive moisture, and to render the mixture porous, so that the gas will readily pass through it in the purifier. I, however, prefer the kieselguhr, as giving the best results. A compound or mixture thus prepared, without the addition of sawdust, when being treated to recover the sulphur in the formation of sulphuric acid, does not burn away to any appreciable extent; and the residuum can be repeatedly used for purifying purposes, and also forms a good base from which to prepare red colour. Such pigment is prepared by calcining the spent oxide to drive off the sulphur, and then reducing it to the required consistency by trituration. The material may also be further improved for purifying purposes by treating it with atmospheric air or oxygen in an open or closed vessel, either free or under pressure, with or without agitation, as required, before use or after being placed in the purifier to revivify it. The residual liquor from the galvanizers' pickle, after the iron oxide is separated in the process of filtration, is boiled or evaporated down to suitable strength, and to it is added sulphuric acid. It is then calcined in a retort-furnace or other suitable appliance, condensing the fumes in an ordinary tower, or otherwise, thus recovering the hydrochloric acid in a pure and strong state. The residuum (calcium sulphate) is treated with cyanide blue, or any other colour or material, or disinfecting agent, and formed into bricks for domestic or other use—as rubbing, cleaning, or colouring stones, &c.

Incandescent Gas-Lamps.—Hempel, F. W. H., and Gumpel, M., of Berlin. No. 15,268; Aug. 14, 1895.

The peculiarity of this incandescent gas-lamp is that the head of the burner is covered with wire gauze, or with perforated sheet metal, and provided with a vertical wire gauze or perforated sheet-metal ring, so that the gases issue horizontally and vertically to the ring, and consequently, by the action of a top plate, the flame obtains an enlarged cylindrical form. The carrier for the incandescent mantle is fastened to the plate in the ordinary manner. The object of so arranging that the outflowing vertical gas will meet the horizontally issuing gas, is "to obtain an enlarged and dense flame, and consequently intensified incandescence." If it is desired to use the burner on a spirit, water-gas, or other lamp, a spherical gas collector is interposed between the burner and the gas-pipe. A tube and bell (which cover the top of the tube) give the entering gas an upward and then a downward direction before it enters the collector, whence it travels through the upper nozzle, drawing air through slots in its passage to the burner.

Preventing Naphthalene Deposits in Mains and Services.—Bueb, J., of Dessau, Germany. No. 15,456; Aug. 16, 1895.

This invention relates to "a method for preventing gas-conduits from being stopped by freezing, without reducing the illuminating and heating value of the gas, consisting in producing spirit vapour in an evaporator outside the gas-conduit, in a quantity susceptible of regulation, and in adding the vapour to the gas through a tube introduced into the main-pipe."

In his specification (which is not illustrated), the patentee—after alluding to previous attempts made in the same direction as his researches—remarks that it has been proved by him that the opinion that the water contained in the gas is alone the cause of the freezing-up of the gas-conduits is wrong, as in a severe frost not only water but also benzol is crystallized on the cold walls of the pipes. As in the method of desiccating by freezing cylinders, as well as in the drying of the gas by means of spirits, benzol is also separated, unintentionally, besides water, these methods are no doubt appropriate for preventing the closing of the gas-pipes by freezing. But this is effected at the expense of the illuminating power of the gas. All the methods hitherto proposed in order to prevent the closing of gas-pipes by frost by separating from the gas, while in the gas-works, the condensable constituents, are either inefficacious, or, when they are efficacious, they are inapplicable owing to the decrease of the illuminating power of the gas.

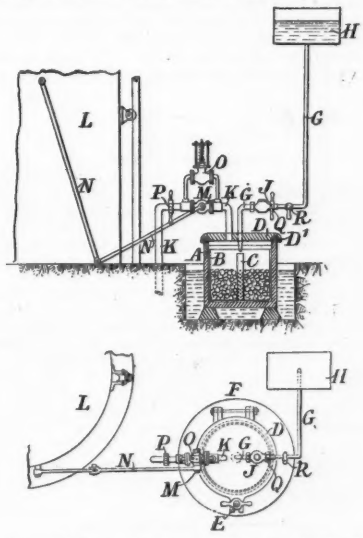
According to the present invention, the patentee proposes to attain the intended purpose, not by withdrawing from the gas any component part, but by adding a substance that shall have the effect of lowering the freezing point of the condensable constituents to such an extent that they precipitate only in a liquid condition. As a suitable means for this purpose, ordinary spirit has proved advantageous. It is added to the gas either at the place of production—preferably behind the gasholder, or at any other point of the pipe network; and in order to avoid any decrease of the illuminating or heating value of the gas, the spirit is added in the form of vapour. This, it is remarked, is necessary, because, although liquid spirit would be absorbed in part by the gas within the gas-conduit, yet, on the other hand, the liquid would absorb benzol from the gas. Moreover, by adding the spirit vapour produced outside the gas-conduit, the quantity of spirit vapour introduced can always be exactly regulated to correspond to the quantity of gas produced, and to the external temperature; while when liquid spirit is introduced into the gas-conduit, the gas passing through takes up a larger amount of spirit vapour, the lower is the quantity of gas delivered at the moment, and the higher is the external temperature.

It is necessary to regulate the addition of the spirit vapour, as, on the one hand, there must always be so large a quantity of spirit in the gas that the intended effect is attained, and, on the other hand, only so much must be added as will remain in the gas in the form of vapour. An appropriate quantity is 5 grammes of spirit vapour per cubic metre of gas delivered; but in the case of particularly severe frosts, a little more may be used.

In practically carrying out the method, a small evaporator of ordinary construction, heated by a steam jacket or by small gas-burners, is used. Into this, the spirit enters from a reservoir arranged at a higher level, through a regulating-valve, in a fine jet, which is immediately evaporated. The hot spirit vapour is introduced through a small tube into the main, and absorbed by the gas. The desired effect of the added spirit vapour only takes place in that portion of the gas supply which is exposed to the action of the frost; the other—ordinarily much larger—portion of the gas being burnt without the spirit contained therein exercising any effect. This is claimed as a great advantage of the new method in comparison with the drying by means of spirit. In the latter method, the whole quantity of gas to be delivered is submitted already in the gas-works to the action of the alcohol, absorbing not only the water but benzol, and thereby reducing the illuminating power. This is entirely unnecessary, as it is always only a small portion of the gas that passes to such places of the conduit (in particular street-lamps) which are exposed to frost. When applied according to the present "invention," on the contrary, the spirit "enters into action only where the gas is acted upon by frost, and at the place where such action takes place, in separating from the gas together with the water and benzol, and thus preventing the latter from congealing, and consequently the conduits from being stopped by freezing."

Decomposing Carbide of Calcium.—Gabe, H., of Copenhagen. No. 15,991; Aug. 26, 1895.

This automatic apparatus for decomposing carbide of calcium consists of a reservoir A, inside of which another removable reservoir B is placed; the latter having an upright perforated tube C placed in the middle. The reservoir is closed by a cover D, which, on the underside, is supplied with a packing D^1, fitting the upper rim of the reservoir, against which the cover (being turnable around a hinge F) is pressed down by the hand-screw E. Two tubes G and K are screwed into the cover. Through the tube G water is led from the water-tank H. The reverse-valve J on the tube G shuts off the water whenever the pressure in the reservoir A exceeds the pressure in the water-tank. The tube K, which opens out into the gasholder L, is supplied with a stopcock M, in connection with the holder, so that it is shut and opened by the upward or downward movement of the holder.



When the stopcock is open, the gas developed by the carbide of calcium enters the holder; but when this latter, owing to the pressure of the gas, raises itself, the stopcock will gradually be closed, and

thus shut off the gas supply. The pressure in the reservoir A will then increase, and the valve J consequently shuts off the water; and the pressure having reached a certain maximum, the developed gas will, through the safety-valve O placed on the tube K, pass into the holder. When the amount of water, which at the shutting of the valve M still remained on the carbide of calcium, has been consumed, the development of gas will stop until gas from the holder is being consumed, and the holder moving downwards opens the cock. The pressure in the reservoir A being now reduced below that in the water-tank H, a new infusion of water takes place; and so on, until the carbide of calcium is completely decomposed—only slaked lime remaining in the reservoir. The cock R on the tube G is then closed; the screws P and Q and the hand-screw E loosened; the cover D opened; and the removable reservoir B taken out. After being cleaned and refilled with carbide of calcium, it is closed, and the development of gas again takes place.

The reservoir is shown placed in a water-container that serves to draw off the heat developed through the decomposition.

APPLICATIONS FOR LETTERS PATENT.

19,241.—GIFFARD, P., "Back-pressure valves." Oct. 14.

19,253.—LAKE, H. H., "Manufacture of sulpho-acids of the naphthalene series, and of colouring matters derived therefrom." A communication from the Farbwerk Mühlheim. Oct. 14.

19,267.—GANS, P. F., "Lighting apparatus for explosive gas mixtures, more especially for motors." Oct. 14.

19,270.—HETHERINGTON, A. E., RASCHEN, J., HURTER, F., and BROCK, J., "Manufacture of sulpho-cyanides." Oct. 14.

19,286.—JACKSON, J. C., "Preventing the bursting of service-pipes and hot-water boilers." Oct. 15.

19,301.—CHAPMAN, L., "Valves for controlling and arresting the flow of gases and liquids." Oct. 15.

19,303.—GREENHILL, J. H., "Gas-engines." Oct. 15.

19,307.—CHAMBERS, W., "Gas-engines." Oct. 15.

19,330.—GLADWIN, A. H., "Faceted globes, shades reflectors, &c., for lamps." Oct. 15.

19,353.—JAHNSSON, J., "Electric gas lighting apparatus" Oct. 15.

19,355.—MÜLLER, A., "Regenerative gas-furnaces." Oct. 15.

19,386.—HAMILTON, J. H., "Gas-engines." Oct. 16.

19,407.—PEEBLES, D. B., "Coin-prepayment mechanism for gas-meters." Oct. 16.

19,412.—CROCKER, S. H., "Compounds for treating mantles for incandescent light." Oct. 16.

19,425.—SUTHERLAND, J. G., "Prepayment gas-meters." Oct. 16.

19,429.—MARCUS, S., "Bunsen burners." Oct. 16.

19,445.—ELWORTHY, H. S., and HENDERSON, P. D., "Manufacture of carbonic acid gas by the utilization of waste product produced in making calcium carbide." Oct. 16.

19,528.—MARTINI, A., "Burning, suspending, and securing incandescent bodies." Oct. 17.

19,590.—PARDOE, G. T., "Controlling the flow of liquids in pipes or other conduits." Oct. 18.

19,615.—BOURGOIN, A., "Making gas of carburetted air and carbonic oxide." Oct. 18.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Oil-Gas Experiments at Bradford.

SIR,—Mr. Wood has a fine talent for denying what appears to be evidence furnished by his reports and letters. The account I gave of his sending a letter asking for *information on behalf of his Committee* without the sanction of that Committee, and against the express warning of the member of the Committee who was deputed to look after the business of the sending of a letter to another gentleman, he says is untrue. Before giving that account, I took the precaution of obtaining a categorical statement of the affair, and a copy of the minute relating to it; and the only answer that it is possible for me to send to Mr. Wood's letter of the 16th inst., now that he plants the discussion on the basis of veracity, is to enclose you, with permission, my authority for what I have stated, and the Committee minute for your perusal. Full confirmation of my other statements, the truth of which he now denies, will be found in his various reports, letters, and carburetting-book.

LEWIS T. WRIGHT.

Oct. 26, 1895.

[ENCLOSURES.]

Extract from a Letter.

Scarr Hall, Bradford, Oct. 19, 1895.

Dear Sir,—Your account in the JOURNAL OF GAS LIGHTING as to Mr. Wood sending you a letter *without orders* from the Gas Committee, asking for information for the Committee, *is quite correct in every point.* Wood was ordered to write to *Mr. Frank Wright*, who had sent me a letter on this "candle thousand and foot candles," which letter I read to the Committee. Wood then tried to explain the matter away, *but could not.* Your answer to *my* letter was simply: "A" incorrect; "B" correct. Committee then ordered Wood to state his case in a letter to *Mr. Frank Wright*, and hand that letter to me for perusal. He brought me the letter. His case was properly stated, but addressed to *you*, and not to Mr. Frank Wright. I pointed this out to him, and told him he must *not on any account* send that letter to you *without* the sanction of the Committee. He left me to re-write the letter, and returned with one addressed to *Mr. F. Wright.* I said that it is correct, and I forwarded that letter to its destination, but again cautioned him as to the other letter. He nevertheless sent you the letter.

Yours faithfully, (Signed) T. SPEIGHT.

Extract from Minutes of Committee Meeting, April 4, 1895.

It was agreed that Mr. Wood should put his case in his own way, and then it should be submitted to Mr. F. Wright.

The Proposed Lighting of Laira.—The inhabitants of Laira, a suburb of Plymouth, rejected last Friday the proposal, referred to in the JOURNAL for the 15th inst., to adopt the Lighting Act.

LEGAL INTELLIGENCE.

A Moot Point under the Metropolis Water Act, 1871.

At the Worship Street Police Court, on Monday last week, Mr. G. Kebbell, the Solicitor to the East London Water-Works Company, attended with Mr. Tiddeman, a Solicitor representing Mr. J. B. Kyffin, a draper of the Hackney Road, who in July last (see *ante*, p. 243) instituted proceedings against the Company for neglecting to supply to his premises sufficient water for domestic purposes. It may be remembered that, at the hearing of the case, Mr. Bushby dismissed the summons on the broad ground that the water-rate had to be paid in advance, and that this had not been done by the complainant. In addition to the point as to the rates, Mr. Bushby was in accord with a contention raised by Mr. Kebbell, that a notice to the Company requiring them to furnish a constant supply was required before proceedings could be taken for default, in accordance with the Metropolis Water Act, 1871, as amended by the Public Health Act, 1872 (35 & 36 Vict., cap. 79); and he agreed to state a case for a Superior Court. Mr. Kyffin lodged notice of appeal; and the parties now came before his Worship to settle the points for argument.

Stealing the Brentford Company's Gas.

At the Brentford Police Court, on Monday last week, Robert Mixozon Easton, a plumber, of Arragon Road, Twickenham, was summoned for stealing a quantity of gas, valued at about £9, the property of the Brentford Gas Company. Mr. Woodbridge, who prosecuted, said the meter at the defendant's house had been disconnected, and the pipes sealed up; but on an officer of the Company visiting the premises, it was found that gas was being used in all the rooms—a lengthened piece of pipe being carried to the house from the main. The appearance of this pipe denoted that it had been used for a considerable time. The Company had not supplied defendant with any gas; the pipes having been disconnected in 1892, during the tenancy of another person. The amount mentioned in the summons was what would be the average for a year's gas, though the consumption might, of course, have been going on for a longer or a shorter period. The Company were not desirous of punishing anybody; but at the same time they wished to have the case treated in such a way as to show the general public that they could not defraud gas companies with impunity. Mr. E. Bugby, one of the Company's inspectors, deposed to calling at the defendant's house, and finding the gas burning. He made an examination of the premises, and found the Company's main had been opened, and a supply of gas obtained by means of the pipe alluded to, which he was sure had not recently been put in position. He at once cut off the gas, and sealed up the pipe. The cost of a year's supply of gas for premises like those occupied by the defendant would be from £8 to £9. Mr. Lewis, for the defendant (who was only twenty years of age), said his client pleaded guilty, but wished to explain that, owing to his wife's illness, he had been much inconvenienced by not having gas. He, however, did not make the connection, which must have been done by some former occupier of the house. The Bench imposed a fine of £10 and costs; the Chairman remarking that in the last case of the kind, the person accused was sentenced to three months' imprisonment.

The Supply of Gas Companies' Accounts.

The Hertford County Bench had a special sitting on Saturday, the 19th inst., to hear two summonses taken out by Mr. A. Baker, a solicitor, against the Hertford Gas Company (1) for not forwarding to the Corporation of Hertford, on or before March 25 last, an annual statement of the Company's accounts made up to Dec. 31, 1894, in the form prescribed by the Gas-Works Clauses Act, 1871; and (2) for not keeping and selling to the plaintiff copies of their accounts for the years 1890-4. The Company's representative (Mr. C. E. Longmore) having raised a preliminary objection that they had been charged with five separate offences on one summons, Mr. G. Elliott, who appeared for Mr. Baker, said he would confine himself to the year 1893. He then proceeded to explain that the Company were incorporated by an Act passed in 1864; the Gas-Works Clauses Act, 1847, being incorporated with it. The General Act subsequently passed—the Gas-Works Clauses Act, 1871, had to be construed with the provisions of the earlier Act, except where there was inconsistency. The 35th section of the Act of 1871, which provided for the furnishing of copies of accounts to local authorities or private parties, therefore applied to the Hertford Company, who were not exempted from making up their accounts to Dec. 31 instead of to June 30. The well-known Dudley case was quoted in support of this contention. Mr. Longmore submitted that the ordinary reading of section 3 of the Act of 1871 justified the conclusion that it did not apply to the Company in regard to the date for making up their accounts. He went on to explain the difficult circumstances in which they had been placed owing to the disappearance of their books (see *ante*, p. 594); and he urged this in justification of the failure to make out the accounts to the end of last year, and asked the Bench to dismiss the summonses. The Magistrates declined to do this; and they fined the Company 1s. and 9s. costs in each case. [A more extended report of the proceedings will appear next week.]

Sales of Shares.—Some fully paid £10 shares in the *Huntingdon and Godmanchester Gas Company* were recently sold by auction at £18 and £18 2s. 6d. each, with the dividends accruing thereon.——Last Wednesday, 22 £10 shares in the *Brompton, Chatham, &c., Water Company* were sold at an average price of £15 7s. each.——At a sale of miscellaneous shares and stocks at Bradford last Thursday, Messrs. W. G. Stansfield and Co. sold £500 of original 10 per cent. stock in the *Shipley Gaslight Company* at £237 per cent., and £1000 of new ordinary 7 per cent. stock in the same concern at £165 per cent. ——A small amount of original consolidated stock in the *Airedale Gas Company* was disposed of at the rate of £213 per cent.

MISCELLANEOUS NEWS.

THE GAS QUESTION IN LIVERPOOL.

Sir A. B. Forwood on the Proposed Competitive Gas Supply—Alderman Smith Criticizes Mr. Livesey's Letter.

The recent decision of the Liverpool City Council to take steps to start a competitive gas supply, as already recorded in our columns, continues to give rise to much comment in the city. Among the critics of the proposal stands prominently Sir A. B. Forwood, M.P., who, at a meeting of influential Conservatives a few days since, spoke his mind on the subject in no uncertain manner. He charged Alderman Smith and the seconder of his motion (Mr. Holt) with having grievously misled the Council and the public. He then went on to say: "The Gas Company have a parliamentary right to supply Liverpool with gas, and to charge not exceeding 4s. 6d. per 1000 cubic feet, always provided that they do not receive more than a certain rate of interest upon their capital. They have a margin to-day, as security for their interest, between the price they are charging consumers and their maximum price, of more than 50 per cent. Therefore, for all reasonable purposes, they have an almost absolute security for their income. I think I should explain that those who have provided four-fifths of the capital for carrying on the gas-works have bought their stock at public auction, and paid a large premium, representing about £400,000, upon the nominal capital, which premium has also been spent in new works; so that the Company's shareholders are not receiving the gigantic interest which many suppose. In fact, the gas consumers, upon the last issue of shares, are only paying about 4¾ per cent.—not high for a concern trading in an article liable to supersession—and on the bonds £3 12s. 6d. Mr. F. Smith, for the purpose, no doubt, of influencing votes at the coming election, proposed in the Council, and Mr. Holt seconded, a resolution, which was adopted by the Radical members present—'That the Council should promote a Bill in Parliament to obtain powers to establish and maintain a competitive gas supply by the Corporation.' Let me pause and ask you to contemplate for one moment what would have been the effect on the gas consumers of Liverpool if this crazy resolution were to be put into force. The gas shareholders, no matter what may be the demand for their gas, are entitled to charge up to a maximum of 4s. 6d. per 1000 cubic feet. The proposed Corporation competitive works would have taken some of their customers; and to make up for the loss thus sustained, the Company would have simply raised the price from that which they now charge to the 4s. 6d. per 1000 cubic feet, or such lesser price as would enable them to earn their dividend. This resolution was passed at the tail-end of a Radical Council meeting; and the three Radical leaders must have known, or, if they did not, they ought to have known, it was all the time in violation of the Acts under which corporations are bound. I will read you the extract from the Borough Funds Act, 1872, bearing on this matter: 'Provided that nothing in this Act contained shall authorize any governing body to promote any Bill in Parliament for the establishment of any gas or water works to compete with any existing gas or water company established under any Act of Parliament.' It is clear that the gentlemen promoting such a resolution under such circumstances must be judged by one of two alternatives—either they were ignorant of the law relating to the office they hold, or they deliberately lent their support to a put-up job, with a view to deceive the public to catch votes. On either hypothesis, I submit that no party led by them is fit to be entrusted with the government of the city. Mr. F. Smith has a perverse habit of making misleading statements on gas matters, notably when quoting the Chairman's remark of saving in cost of coal of £60,000. But he omitted to mention the falling-off in sales mentioned in the same speech. Also, when comparing the cost of coal in Liverpool for gas purposes with Sheffield, he selected the period of the coal strike, which did not affect the cost of coal at Sheffield during the period under comparison. Undoubtedly there is an opening for improvement in the relations of the Gas Company with the Corporation; and economy in the cost of production can be made by alterations in the standard of lighting, fixed in the earlier days of the science of gas making. I omitted to mention another incorrect statement of this gentleman, when he gave 2s. as the cost of water gas in Liverpool, as against 1s. in Belfast. I am told his comparison is absolutely worthless, and cannot be proved. I am not a gas expert, but I have seen returns which show the high residual results in quantity compared to other towns. No cause can be forwarded by misrepresentation, whether arising either from intention or ignorance; and until a change is made in our gas administrator, Mr. Smith, no satisfactory arrangement is possible between the Gas Company and the Corporation."

In a communication addressed to the *Liverpool Courier*, Alderman Smith has criticised Mr. Livesey's recent letter to that paper, which we gave in the JOURNAL last week (p. 833). He says: "Mr. Livesey states that a competitive gas supply is utterly out of the question, forgetful that we have nine members in a Parliament which is all powerful, and that they must be strongly animated by a desire to benefit Liverpool. Profound respect as I have for Mr. Livesey as an Engineer, are we to take his legal opinion that there are no methods that would enable our great Corporation to go to Parliament to alter the procedure, so that the consumers of Liverpool gas, if they could show a saving of £100,000 to £150,000 per annum, could obtain powers to do it?" Dealing with Mr. Livesey's suggestion that "friendly negotiations" should be opened with the Gas Company, Alderman Smith gives his version of previous interviews, which he says were not helpful; and he thinks Mr. Livesey cannot know the Directors and officials of the Company—the "autocrats of Duke Street"—as he politely designates them—as the Liverpool people do. Passing to the question of testing the gas, Alderman Smith assumes that Mr. Livesey cannot know that the Corporation's powers of testing are "statutorily fixed for one spot only;" as, if he did, he would "smile at such gas testing." He adds that, "if the Company have been and are now providing such excellent light, why should they hide it under a bushel of one test-room? They ought not to do good by stealth, and blush to find it fame." Coming, finally, to the subject of the coals used, Alderman Smith says: "Let Mr. Livesey extend his courtesy to letting the 70,000 odd gas consumers here know if it was defensible of the Liverpool Company to pay 20s. 7d. per ton for coal in 1894, so near to the coal-fields, when he bought at a little over 10s. per ton for his Company in London. He has the fullest knowledge of coal values and the cost of modern enrichment; and if he will give a moment's consideration to the needs of this great trading community, and, in addition to the trouble he has already taken, give a clear and definite reply to the query raised above, his action will be much appreciated." To the letter from which we have extracted the foregoing remarks, the Editor of the *Courier* appended the following note: "There is no need to say one word with reference to the style of this criticism; it carries its own condemnation. It may now please Alderman Smith to sneer at Mr. Livesey's professional competency; but he altogether overlooks the fact that Mr. Livesey was held in such high confidence by the Lighting Committee that they offered him a retainer as their engineering adviser. It is only when Mr. Livesey declines the offer—for good reasons—that Alderman Smith attempts to disparage his reputation. Perhaps the bad temper is attributable to the disagreeable fact that the Lighting Committee are repudiated and censured by their own chosen witness."

LEEDS CORPORATION GAS SUPPLY.

How the Debt on the Gas-Works was Liquidated.

It may be remembered that, when moving the resolution to reduce the price of gas, at the meeting of the Leeds City Council on the 9th inst. (*ante*, p. 787), Mr. Tweedale reminded the members that the deficit of £31,000, which had accumulated during the past few years upon the gas undertaking, had been wiped off, and that the last financial year ended with a balance in hand of £2500. The credit for bringing about this gratifying state of things is claimed by both parties on the Gas Committee; but it is probably really the outcome of the policy pursued by Mr. Alderman Gilston, who was Chairman of the Committee up to November last year. However this may be, there is the fact; and it may not be without interest to show how it was accomplished. This we are able to do by the following extract from the *Leeds Mercury* for last Thursday:—

For many years the control of the gas-works has been in the hands of the Liberals, who formed a majority of the Council and Committee; and though it cannot be said that mistakes were never made, yet, on the whole, considering the price of gas, and its illuminating power, the inhabitants have not had much reason to find fault with the management. It has always been the aim of the Committee simply to make the undertaking pay its way, and to supply gas to the citizens as cheaply as possible. Gas, with an illuminating power of 19 candles, was charged at 1s. 10d. per 1000 cubic feet. The high price obtained for residuals not only allowed the Committee to do this, but, out of the profits made year by year, a sum of a quarter of a million was handed over to the sinking fund; and between £50,000 and £60,000 taken from the funds of the Committee went to reduce the price of gas for the public lamps. Twelve years ago, for every 20s. expended on coal, an equal sum was obtained from the sale of residuals.

These were halcyon days for the Committee. But bad times were to come. Depression in trade had its effect on the residuals; and tar and ammoniacal liquor, which in the two years 1884 and 1885 yielded £103,755, fell suddenly and so low in price that the deficiency in yield for the next two years was, upon the basis of coal consumed, no less than £73,612, and at the end of the year 1887 the accounts showed a revenue deficiency of £36,000 for two years and a half. A few thousand pounds were transferred from the reserve, &c., fund; and the net deficiency at that date stood at £30,976. A small addition to the price of gas would easily have enabled the Committee to get out of their financial difficulty; but they were hopeful that the prices of residuals would recover, and did not suggest any increase to the price paid by the consumer.

In the following year there was a slight improvement. The Corporation now altered its financial year, making it close on the 25th of March; and the next accounts were for a period of fifteen months—viz., from Jan. 1, 1888, to March 25, 1889. These showed a net profit of £15,829 12s. 11d., of which £9407 18s. 9d. was set apart for the sinking fund; leaving a surplus of £6421 14s. 2d., which brought down the deficiency to £24,554 2s. 3d. In March, 1890, there was a surplus profit of £5423 2s. 8d., which reduced the adverse balance to £19,130 19s. 7d. If matters could have gone on thus smoothly, the deficiency would soon have disappeared; but the Committee were about to pass through a troublous period. The coal contracts entered into in June, 1890, were, on the average, 2s. 2¾d. per ton above those of the preceding year, which, on a consumption of 240,000 tons, represented a very large addition to the Committee's expenditure. In the same year occurred the dispute with the gas stokers, which resulted in a reduction in the hours of labour at the gas-works, and an increase in the number of men employed, necessitating an additional expenditure of about £14,000 per annum. For six months these increased charges were borne by the Committee; but it was now obvious that an advance in the price of gas was necessary, and the City Council sanctioned an increase from 1s. 10d. to 2s. 2d. per 1000 cubic feet. The close of the next financial year exhibited a deficiency of £14,728, which brought up the total adverse balance to £33,859. The Committee then began to make a small profit, which, in the year ending March 25, 1893, amounted to £3141, after setting aside £10,118 7s. for the sinking fund; and this reduced the indebtedness to £30,717 17s. 5d.

The prolonged dispute which occurred in the coal trade in the autumn of 1893 placed the Committee in further difficulties, and greatly enhanced prices had to be paid for coal. Supplies had to be obtained from Durham and other places at a sum which was equal to an increase of about 7s. 2d. per ton on the current prices entered into by the Committee in June of that year; and the quantity purchased made an addition of £26,369 to the figures under the contract rates. Increased labour during the same period cost the Committee £1931. On the other hand, there was an increase of £3679 in the sales of coke;

and deducting this amount, the loss sustained in consequence of the coal trade dispute was £24,621. Gas-meter rents were abolished from Jan. 1, 1894; thus conferring a benefit upon small consumers. But to meet the loss occasioned, and the greatly increased expenditure in which the Committee had been involved by the dispute in the coal trade, Alderman Gilston, at the meeting of the Council in December, 1893, moved an increase in the price of gas from 2s. 2d. to 2s. 4d. per 1000 cubic feet; and this was adopted. When the next coal contracts came to be considered, in June, 1894, the price of coal had fallen considerably; and the Committee were able to secure all they wanted —259,000 tons—at an average cost of 9s. 8½d. per ton, or a reduction of 2s. 3½d. on the average prices of 1893.

With the advance of 2d. per 1000 cubic feet, the low prices paid for coal, and the fact that less cannel was necessary in consequence of a reduction in the illuminating power of the gas from 19 to 18 candles, the liquidation of the debt became only a question of time. The way having thus been made easy and pleasant for them, the Tories, in November of last year, accepted the responsibility for the management of the gas-works, which their majority on the Committee entitled them to; and at the close of the financial year, in March, they were able to announce that the debt had been removed, and that there was a balance in hand. At the meeting of the Council, held on the 9th inst., the price of gas was again reduced to 2s. 2d. per 1000 cubic feet; and even with this reduction, should the rates for coal remain low, and the receipts from residuals be satisfactory, there is no reason why the gas-works, whether under the control of a Liberal or a Tory Committee, should not exhibit a handsome surplus at the close of the year. The revenue account for the year ending June 30 last shows that the sale of gas produced £257,861; from residual products £65,916 was obtained; and old metal, carbon, spent oxide, and rents of property realized £564 —making a total revenue of £324,341. On the other side, it is seen that the manufacture of gas cost £200,587; its distribution, £24,609; rents, rates, and taxes account for £6862; and management and general charges come to £4079. The sum of £3511 was put down as bad debts; £43,747 was the amount paid for interest; and there was a balance—being net profit—of £40,944. Of this sum, £11,078 was applied towards the reduction of debt; and there was a balance (being surplus profit) of £29,866.

GAS-WORKS EXTENSIONS AT ROCHDALE.

The Development of the Undertaking.

Last Thursday week, in response to an invitation by the Gas Committee, the members of the Rochdale Corporation visited the Gas-Works, for the purpose of inspecting the extensions recently made. The Chairman of the Gas Committee welcomed the visitors; and then called upon the Engineer (Mr. T. B. Ball) to explain the character and extent of the enlargements and improvements.

Mr. Ball said the new works consisted of a retort-house, which extended right across the yard from Dane Street to Manchester Road. The main approach to the new building was by means of a high-level covered cart-road leading from Manchester Road; and the arrangement of the retort-house was such that it was now unnecessary to touch the coal delivered there after it had been tipped from the carts using this high-level road. When the coal was so tipped, it fell through sloping shoots into the stores 25 feet below; and thence it was raised by means of elevators to storage hoppers and measuring chambers at the top of the building. The retorts, which were all inclined, were fed from the measuring chambers—each charge being measured before being let out; and this feeding was managed by means of a travelling, adjustable shoot, one end of which was fixed in the mouth of the retort that was ready for charging. All these operations were performed by mechanical means; but, of course, the drawing of the retort was still done by manual labour. When the retorts were drawn, the coke fell, again by a sloping shoot, into the basement of the building, or rather on to the ground level 10 ft. 6 in. below the retorts, whence it had to be wheeled into the yard before it could be carted away. As it might seem strange that the coal should be first of all dropped 25 feet in order that it might be picked up again by the elevators, he should like to point out that this was a distinct advantage, as the low-level coal-store resulting from this method formed a natural hopper, which kept the elevator buckets supplied mechanically. If there was not a good depth of coal for the buckets to work through, they would have to be supplied by means of more carting. At present, there was no mechanical arrangement for taking the coke from the basement of the retort-house into the yard; but no doubt even this would be managed mechanically some day.

The party then proceeded to the new retort-house, where they witnessed the charging and drawing of several retorts, and the filling of some of the storage hoppers and measuring chambers. Subsequently the other extensions were also inspected. Altogether, the new works increase the premises by about 50 per cent. The retort-house covers rather more than 2000 square yards; and there is also a new gasholder erected on land in Church Street. This adds about 2,250,000 cubic feet to the storage capacity, which is thus raised to about 3,750,000 cubic feet. The new holder takes the place of one which has been in use for thirty years, and which will now be converted into a tank for ammoniacal liquor. One of the changes involved by the erection of the new retort-house was the removal of a block of workshops and stores. To make up for the loss of these, new workshops are being erected between the offices and the retort-house, and stores are being provided on the Church Street side of the site. One-fourth of the new retorts are now in use; and the remainder will be brought into operation as they are required. When the whole of the new retorts are in use, they will deal with from 140 to 150 tons of coal per 24 hours. With the new retorts and the old ones in full operation, the quantity of coal dealt with could be increased to no less than 400 tons a day. For these new works, the Local Government Board sanctioned a loan of £65,000; and of this sum about £56,000 has already been expended. The greater part of the work for which the loan was obtained has been done under contract.

To celebrate the completion of the various extensions, the Mayor (Mr. Hardman), later in the day, entertained the members of the Corporation and a number of other gentlemen to a banquet. The toast of the evening was "The Corporate Undertakings," in responding to which Alderman Petrie naturally made particular allusion to the gas-works. These, he said, became the property of the Town Commissioners in 1844; being purchased for the sum of £27,700. Since then the growth and development of the undertaking had been strong and steady. He did not know what the production of the works was in 1844; but he found that the weight of coal carbonized in 1877 was 26,000 tons, whereas last year it was something like 43,000 tons. This was a large increase in 18 years—a period during which, as they knew, they had passed through many troublous and depressing times in the town. If the prosperity of the borough had increased in the same proportion during that period, he thought they had good ground for congratulation. It was just thirteen years since the Committee began to feel that the requirements were greater than their plant could supply, and that they must look out for the best way in which to enlarge their powers of production. They had an earnest desire that any extensions they made should be on the very best principle that the science of gas making knew. A corner of the store-room in the old retort-house was utilized, and two systems of retort-settings on the regenerator principle—Siemens's and Klönne's—were tried. The result was satisfactory compared with the old system; but it was not so good as to tempt them to make a large outlay upon those systems. Subsequently they heard of inclined retorts; and they became so convinced of the excellence of this system, that they decided to adopt it. It was a curious system—one of persuasion rather than of compulsion; for it was useless unless they got the retorts inclined at exactly the correct angle of repose. Since the purchase of the works, there had been a capital outlay of some £190,000; but the great bulk of this was expended prior to 1882. From 1882 to 1892, just before the time when they began to spend money on these extensions, they expended less than £10,000 on capital account. In their journeyings, the Committee had inspected some of the very best works; and they were satisfied that their own were, in the excellence of their design and of their construction, equal to the very best they had seen. It would be very remiss and not honest if he did not acknowledge their indebtedness to Mr. Ball for the great ability which he had displayed. The town had been in possession of the works for 51 years; and to his astonishment he found that, by the forbearance and confidence of the Committee, he had had the honour of being Chairman for more than a third of that period. Among the other toasts was "The Town Clerk and Corporation Officials," to which Mr. Zach. Mellor and Mr. Ball replied.

THE NEW HOLDER AT THE MIDDLESBROUGH GAS-WORKS.

Our readers will probably remember that the provision of additional storage at the gas-works was a subject which occupied the attention of the Middlesbrough Town Council on several occasions in the summer of last year; the outcome being the acceptance of a tender submitted by Messrs. Ashmore, Benson, Pease, and Co., Limited, for the construction of a holder, with their wire-rope system of guiding, for £14,400. No time was lost before the work was commenced; and such satisfactory progress has been made that the holder is expected to be ready for the reception of gas in the course of a week or two. In view of this fact, the following particulars, supplied to us by the Gas Engineer to the Corporation (Mr. David Terrace) will no doubt be read with interest.

Exploration holes were sunk near the site of the proposed tank, when it was found that there was a bed of hard clay about 5 feet thick within a few feet of the present surface. Under the clay, the ground is of a very boggy nature; so it was decided to erect the tank on a foundation of 3 feet of concrete on the hard clay. This is extended to receive columns to guide the holder, should this system afterwards be determined upon. The tank is 186 ft. 6 in. diameter and 31 feet deep. It is made of steel throughout; the lowest tier of plates on the sides being ⅝ inch thick—a sufficient strength to stand double the water pressure to which they will be subjected. The platform round the lip was designed for being 2 feet wide; but this was increased to 3 ft. 8 in., in order to give easy access to the pulleys for the wire-rope guiding of the holder. The tank will contain 5,286,000 gallons of water, or about 23,600 tons.

The holder is in three lifts, of the following diameters: Outer, 184 feet; middle, 181 ft. 6 in.; inner, 179 feet. Each is about 30 feet deep; thus giving a total capacity of 2¾ million cubic feet. The lifts are constructed in the ordinary manner with cups and dips. The crown, which has a rise of 9 feet, is on the non-trussed principle; being the usual method with holders of this size—that is to say, instead of the crown being supported on a trussed iron framework attached to the top curb, with the centre post resting, when the holder is out of action, on the foundation in the tank, there are placed 83 wood uprights "anchored" to stone bases. These uprights, braced by diagonal struts, are surmounted by radial arms kept in position by timbers shaped to suit the resting of the crown.

The weight of the holder will be 335 tons; of the tank, &c., 623 tons; of the water, 23,600 tons—making a total on the foundations of 24,558 tons, or a pressure of 1·15 tons per square foot. The weight of the foundation being 7335 tons, there is a total weight of 31,893 tons.

The inlet and outlet pipes (30 inches in diameter) penetrate the bottom of the tank, and are embedded in pitch on concrete foundation. The 24-inch cast-iron pipes connecting the gas-inlets from the works to the holders, and also connecting the gas-outlets from the holders to supply the town, converge to the governor-house, which is being built in such a position, and with the connections so arranged, that it will serve for future holders.

The Proposed Water Trust for West Kent.—The proposal that the various local authorities in West Kent should join in promoting a Bill in Parliament to enable them to form a Water Trust for the acquisition of the undertaking of the Kent Water Company, and of so much of the Lambeth Company's plant as is situated in Kent, has been formally sanctioned by the Beckenham ratepayers.

THE DVORKOVITZ OIL-GAS ENRICHMENT PROCESS AT BRADFORD.

Mr. Isaac Smith's Offer.

At the Meeting of the Bradford Town Council last Wednesday, the Town Clerk (Mr. W. T. M'Gowen) read the following letter which had been addressed to him:—

Oct. 23, 1895.

Dear Sir,—In order to clear away what seems to be the only remaining obstacle to the acceptance by the Council at their meeting to-day of my recent offer, I repeat in writing the statement I made verbally to the Sub-Committee last week—viz., that I agree to the increase, if any, in the fire insurance premium which could be occasioned by the proposed addition to the plant being regarded as part of the expense of enrichment by oil gas; the whole of the expense I am to guarantee shall not exceed ½d. per candle per 1000 cubic feet. That being the case, my combined offers stand as follows:—

(1) The Corporation undertaking to work the oil-gas plant now in Thornton Road for six months continuously, and granting space at one other of the gas-works in the town for the erection of the carburettor or other simple appliance for treating the bye-products, I hereby guarantee that the cost of enrichment by means of the Dvorkovitz process shall not exceed ½d. per candle per 1000 cubic feet of gas supplied for consumption.

(2) If the cost of enrichment, including extra fire insurance premium, if any, be found not to exceed ½d. per candle per 1000 cubic feet, then the Corporation at the end of six months take over the whole plant at cost price.

The above terms are to be treated as additions to the benefits to which the Corporation are entitled under the agreement of Aug. 7, 1894; and I would point out that together they secure to the town the opportunity of using the process for six months without a particle of risk, with the privilege of continuing its use afterwards without royalty or other charge.

The negotiations with the Council having lasted so long, I trust that a definite conclusion will be arrived at to-day.

(Signed) ISAAC SMITH.

Mr. H. B. Ratcliffe moved that the letter be referred to the Gas and Electricity Supply Committee. To this proposition an amendment was submitted, that the matter should be dealt with at the present meeting, in conjunction with the Committee's minutes. Mr. Speight thought the Committee should be left to deal with the letter. The Chairman of the Committee (Mr. W. C. Dixon) said the matter was adjourned at the Committee meeting because there were many points to be decided. For instance, some gentleman would have to be selected to conduct the experiment. To carry on a test in the future as had been done in the past, would simply be to make it of no use; and there would be a difficulty in agreeing on some gentleman. Eventually the amendment was defeated by 20 votes to 15; and the original motion was carried. At a subsequent stage of the proceedings, the matter came up again, on the motion for the adoption of the minutes of the Committee. Alderman Morley said that, at the last meeting of the Council, it was resolved to refer the oil-gas question back to the Committee for further consideration. If the question could be settled at the present meeting, the borough would be saved a considerable sum. The offer of Mr. Isaac Smith, as contained in the letter which had been read earlier in the meeting, was a magnanimous one. It was a matter in which no member of the Corporation was interested in any shape or form; and there was no reason why a decision should not be taken at once. He moved, as an amendment, that an experiment with the oil-gas process be made in accordance with the terms of Mr. Isaac Smith's letter. Mr. Ratcliffe called attention to the fact that the Council had already referred this letter to the Committee. Mr. Toothill having seconded the amendment, some conversation arose on a point of order; and the Town Clerk said the amendment was irregular. The Mayor (Alderman Wood) ruled accordingly; and the minutes were adopted.

THE PROPOSED PURCHASE OF THE SOUTH MOLTON GAS-WORKS BY THE CORPORATION.

At a Meeting of the South Molton Town Council last Friday week, a report was presented by the Committee recently appointed to confer with the Directors of the Gas Company as to the purchase of the works by the Corporation. The Committee unanimously recommended the Council to purchase, at the price asked by the Company (£3300). Before a provisional contract was signed, however, it was considered by them advisable to have the advice of a competent gas engineer. The Directors of the Company wrote that it was their desire to benefit the borough as much as they could; and that no such sum as £3300 would have been accepted from any other person or company. The works were in a good state of repair; and the lessee's term expires at Midsummer next. The meters would have to be taken at a valuation, as they were the property of the lessee. The average net income for the past eleven years had been £246.

In moving the adoption of the report, the Mayor (Mr. A. E. Shapland) said he considered the works would be a valuable addition to the borough property, as the Corporation now paid £200 a year for gas. The purchase money could be borrowed for 3½ per cent.; the repayment being extended over a period of years, so that the borough rates would not be increased. Indeed, the profits made should reduce the rates. The Directors had no wish to force the works on the Corporation; but he considered that the supply of light and water should be under the local authority. Mr. Richards seconded the motion, and referred to the fair manner in which the Directors had met them. They had not only submitted the books of the Company and of the lessee, but the profit and loss account, which showed the Company to be in a solvent condition. The Directors were tradesmen of the town—not speculators who would be off directly the purchase was completed. The Corporation should not hesitate to purchase, and secure the 6 per cent. dividend. They need not fear the electric light. Their neighbours, the Tiverton Town Council, some time ago acquired power to provide electric lighting; but only a short time since, they purchased the gas-works for £20,000. Their predecessors had with much advantage secured the monopoly of the water-works; and they would be failing in their duty if they omitted to secure the gas-works. Mr. Cock, who moved the rejection of the report, said that, if the Council had purchased the works twenty years ago, it would have been a good investment; but the works had had a good many years' wear, and were now in a rotten state. He was surprised the Progressive members of the Council were willing to venture on a worn-out thing, when the electric light was staring them in the face. After further discussion, a member proposed that a ratepayers' meeting should be called to consider the report; but he was ruled out of order by the Mayor. The amendment for the rejection of the scheme was then put and carried by 7 votes to 3—two members who are shareholders in the Company not voting. It was afterwards decided to call in Mr. H. A. Willey, of Exeter, to consider the matter, as recommended by the Committee in their report.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at No. 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice calling the meeting; and the report and accounts, which were referred to in the JOURNAL for the 22nd inst., were taken as read.

The CHAIRMAN said the accounts were, as the report stated, satisfactory, considering all the circumstances. The expenditure for the year ended June 30 last was £1891 more than in the previous year; and the receipts had increased by £1634, or a difference on the wrong side of £253. On analyzing the items of this expenditure, it would be found that coal accounted for £760, but, as a set-off, the gas-rental showed an increase of £1253, which would not be deemed satisfactory had the price of coal remained the same. Unfortunately, they had had to pay for coal an extra 5s. 10d. per ton during the past year, as compared with 1893-4, which, on the quantity of coal carbonized, amounted to £644; thus showing that the increase in the amount of the gas supplied—viz., £1253—had the price of coal remained as in 1894, would have been obtained at an increase of only £116, and in the quantity of coal of only 58 tons, which was very creditable to the management at Ceará. The cost of manufacturing, considering the small extra quantity of coal carbonized, was by no means so satisfactory; and the Manager (Mr. T. M'Making) accounted for this by a substantial increase in the rate of wages paid, and the difficulty of obtaining competent hands—there being a great dearth of labourers in the province. The other items of expenditure had been affected by the same cause. Exchange still held a prominent place in the accounts; and it was £545 more than in the preceding year. When he last addressed the shareholders, he was able to hold out some hope that this would be a diminishing item, as the exchange had then risen to 11½d. per milreis. However, it did not long continue at that figure. He saw, from *The Times* that morning, that it was now at 9$\frac{15}{16}$d., or nearly 10d.; and he was afraid it would be some time before their hopes in this respect were realized. He would here mention, as very creditable working, that they had been paid for 9465 cubic feet of gas per ton of coal carbonized; and the leakage was only 2·2 per cent. In his remarks at the previous meeting, he alluded to the additions to the plant then in contemplation, and expressed the hope that they would be in operation at the end of the financial year. They were not so, as the Directors had had to consider very carefully the capital expenditure these extensions would involve; and, after much consideration, they had been able to place the contract for the supply and erection of the ironwork with a very respectable firm, at a considerably less cost than was originally proposed. All the work was now awaiting shipment. The cost of the additions would be paid from the issue of the 6 per cent. debentures, instead of calling up the unpaid 10 per cent. preference shares—thus saving 4 per cent. on the amount. Brazil was a very disappointing country to deal with in its financial arrangements; and he was not able to predict any favourable alteration in the rate of exchange. He would not prophesy, as he did not know; but the Directors indulged the hope that the steps they had taken to increase the plant, and render it more efficient, would result in a financial saving, and give a more adequate supply of good and pure gas to the consumers.

Mr. J. DARELL BLOUNT seconded the motion, which was unanimously adopted.

A dividend was declared for the six months ending June 30, of 5 per cent. on the preference shares (less tax), and of 4 per cent. on the ordinary shares (tax free).

On the proposition of the CHAIRMAN, seconded by Mr. A. J. KING, the retiring Directors (Messrs. J. D. Blount and F. W. Brothers) were re-elected; and on the motion of Mr. SKAIFE, seconded by Mr. M'MAKING, Mr. Magnus Ohren was re-appointed Auditor.

Votes of thanks for their services were passed to the Chairman and Directors and to the Secretary and the Engineer and Manager, and were duly acknowledged.

Mr. M'MAKING (who is in England for a short time) mentioned that the state of the Company's works was very fair; but with the new plant already ordered, he considered they would be the most efficient in the whole of South America.

AUSTRIAN INCANDESCENT SHARE COMPANY.

The following appeared in the *Financial News* last Thursday: "The report of the Managers of the Austrian Incandescent Share Company for the period from the date of the incorporation of the Company, Feb. 4 last, states that the balance-sheet shows a credit balance of £50,125, after providing for the cost of administration. Out of the balance, the Managers recommend the payment of a dividend of 3s. per share (equivalent to 15 per cent. on the capital), free of income-tax. This dividend is the result of a year's working of the Vienna Company, and will absorb £48,000. A translation of the report of that Company shows the flourishing condition of the concern, and the conservative policy that it has followed from the beginning, by preferring to accumulate large cash reserves rather than pay away all profits in

dividends. The Company has only been in existence for about two years and eight months, during which time there has been put aside out of profit 1,690,186fl. (about £140,000), of which about 1,142,015fl. (£95,000) is invested in safe and easily realizable securities, and 548,171fl. (about £45,000) is deposited at interest in the bank as a special reserve fund. The Company hold, also, freeholds, stocks, &c., to a very large amount, as shown in the balance-sheet; and, in addition, the following assets, which, though mentioned in the report, do not appear in the balance-sheet: Hungarian Incandescent Gas-Light shares, since sold for 715,500fl. (about £59,600); Netherlands Incandescent Gas-Light shares, 12,500, which, at the present market value, represent about £19,000; 255 Swiss Incandescent Gas-Light Company's shares, of a nominal value of 1000 frs. (£40) each; and a considerable interest in the Welsbach patents for some of the principal republics of South America. The profit and loss account shows a net profit of 1,967,191fl. (about £158,000) on a capital of 1,500,000fl. (about £125,000), after deducting not only an ample amount for depreciation of buildings, &c., but, in addition, writing 500,000fl. (about £41,000) off the patent account, which is thereby extinguished, and also, as a matter of precaution, 53,556fl. (about £4460) off the book debts. After paying a dividend of 80 per cent., the Vienna Company have carried forward to next year's profit and loss account an amount equivalent to 20 per cent. on their capital. These figures show the extraordinarily strong financial position of that Company. The current contracts for the sole supply for many years to come of fluid to all the Auer Welsbach Companies in the world, except the United States of America, assures to the Company a large augmentation of profits, as the consumption of the fluid increases every year. To this must be added the profits from the sale of burners and mantles in Austria and other countries supplied by that Company. The value of the Austrian Company's investment in the shares of the Vienna Company is further shown by the fact that the shares for which the Managers paid 5000fl. each in February last now represent a market value of about 13,000fl. each.

ELECTRIC LIGHTING NOTES.

We cannot go so far as a local paper, and suppose that the Local Government Board are taking special interest in the electric lighting scheme of the Wimbledon District Council. At the same time, it must be admitted that there has not been much delay at headquarters, as Major-General C. Phipps Carey is to conduct the official inquiry next Friday. The Local Authority have decided to be represented by Counsel; and Mr. Bidder, Q.C., has been mentioned as the gentleman selected. We understand that a barrister will also be retained by the Ratepayers' Association. In the meantime, the energetic ratepayer whose circular was noticed in the JOURNAL a fortnight ago has returned to the charge by again protesting against the scheme—this time through the medium of the local press. He regards with natural alarm the prospect of having to pay 6d. in the pound more on his rating merely to have a light which will, he believes, be more uncertain than the present oil-lamps. He says: "'It goes against the stomach of my sense,' and I resent it." The oil-lamps have for years been an eyesore to him; but these are better than unreliable, wobbling, flickering electric lights. "Why," he again asks, "do not the Council have the district lighted by gas? There is no satisfactory reason why the Council and the local Gas Company should be at variance. Their interests are identical—the well-being of the district. If the Council were to approach the Company in a cordial spirit, there is no doubt whatever that gas for the public lamps, with the beautiful incandescent burners, would be obtained at 2d. per 1000 cubic feet only more than is now charged by the South Metropolitan Gas Company at Tooting (part of Tooting being within the parliamentary jurisdiction of that Company). Not only would gas be supplied to the public lamps at a cheap rate, but the price of gas would be reduced within six months to the consumers." Ratepayer thinks that if the Council carry out their expensive electric lighting scheme to please their friends, and against the will of the bulk of the ratepayers, it will be doubtful if they will hold their seats. They seem to him to be riding for a fall. Time will show.

The Corporation of Hanley are desirous of extending their electric lighting plant; and they have accordingly applied to the Local Government Board for power to raise £20,000 for the purpose. The matter was recently inquired into by one of their Inspectors (Mr. G. W. Willcocks, M.Inst.C.E.). It was opened by the Town Clerk (Mr. A. Challinor), who stated that the population of the borough was estimated at 56,000, and the assessable value was £182,238, with an outstanding debt of £195,460. Included in this debt was £30,000 for the electric lighting works and plant; and it had been incurred in four loans of £21,000, £5000, £1000, and £3000. The purpose of the proposed loan was to extend the mains, building, and machinery; and it was repayable in 25 years. In February, 1893, the Local Government Board sanctioned a loan of £21,000 for providing the plant, &c., required for the introduction of the electric light into Hanley. This sum had been expended; and, in consequence of the inability of the Corporation to meet their requirements, the Local Government Board, on May 29, 1895, sanctioned a further loan of £5000 for the extension of the plant. So far the Corporation had limited the supply of electrical energy to consumers in and about the centre of the town, and within the area of compulsory supply. They now proposed to extend the mains to various parts of the town and to several places outside the area, because the demand for light was increasing; and in the first nine months (ending the 31st of December last), £31 was realized over the working expenses and the interest on capital. As all the power which the Corporation were capable of supplying had long been taken up by customers and street lighting, the Corporation Engineer (Mr. J. Lobley) and the Electrical Engineers (Messrs. Cowell and Sutherland) had presented plans for a further extension of the works, and reported to the Council. Their report showed that a further sum of £21,000 would be required to carry out the plans, and this was the loan now applied for. Mr. Lobley then gave a detailed explanation of the purposes for which the money was needed. The £20,000, he said, would be expended as follows: £5508 in cables; £5900 in extending the generating station, including an enlarged building and two boilers; £1242 for lighting the Park Road (not provided by arc lamps) and for other roads near the park; £4850 for extensions rendered necessary by the great demand of customers; and £1500 estimated for meters (£1250 of which had actually been spent in extra meters to supply demands). The investigation lasted for a considerable time; but there was no opposition to the application.

Those shopkeepers who have adopted electric lighting for their windows find that the change is not unattended by disadvantages. When gas was employed, there was, of course, a certain amount of warmth. Now complaints are made that in cold weather the windows are more frequently "frosted" than before; and, as this is a serious drawback, many firms are returning to gas lighting, using incandescent burners. This is especially the case in the drapery trade. Those who still use gas on the old system are hesitating to adopt the electric light when better results may be obtained with gas. A speaker at the ratepayers' meeting at Wimbledon, referred to last week—we believe he is a large draper in the town—said he had had a few incandescent gas-lights put up. His gas bill came to £197 in 1892; whereas in 1893-4 it amounted to only £174, including the cost of the mantles. He has since had 18 new burners and two stoves for his workpeople; and yet his gas bill for 1894-5 was only £150. Moreover, his employees are much more comfortable than they were before. In face of these results, he is not disposed to go in for electric lighting.

Two companies have served the Corporation of Devonport with statutory notice of their intention to apply for Provisional Orders to supply electricity in the borough. As the result, the Corporation have decided to go for powers themselves; and they will be among the applicants for Orders in the ensuing session. At the same time, the feeling of the municipal authorities is not one of great enthusiasm for the course on which they are entering. A Committee who considered the question came to the conclusion that it would be expedient to defer any steps for the introduction of the electric light until more experience had been obtained. They were, however, unanimously of opinion that the electric light companies should be kept out.

Mr. W. J. Bird Clerke held an inquiry at Cardiff last Thursday relative to an application by the Corporation for sanction to borrow certain specified sums—among them £12,885 for electric lighting, an £500 for the necessities of public lighting. Regarding the first-named amount, the Mayor stated that the compulsory area was now lighted. A portion of the money—£5385—was required for extensions of the distribution system, and to erect a testing-room—the remaining £7500 being needed for defraying the excess of expenditure over capital already borrowed, and for other proposed works. It was mentioned by the Borough Engineer that the Corporation did not anticipate a great loss on this year's working. The revenue was equivalent to £3300 per annum. They had applications for 12,000 8-candle power lamps; and, in addition, they had applications from numerous houses which were already wired and waiting for the current. Evidence was then given as to the other items for the borrowing of which sanction was sought.

Water Supply at Fires.—One of the largest conflagrations which has lately occurred at Doncaster took place on Monday night last week, when the greater part of the Plant Schools, built by the Great Northern Railway Company for the education of their workmen's children, was destroyed. The disaster is only noticed here as an instance of the evil results following upon the entire shutting off of a water supply which has to be drawn upon in the event of fire breaking out. About a fortnight ago, an old restriction came into force, and the water was turned off at eleven o'clock at night. Forty minutes later, the building in question was found to be on fire; and though the firemen were promptly on the spot with their engines, it seems that about twenty minutes elapsed before water was available. In that time, the fire had, of course, assumed huge proportions. The damage is supposed to be covered by insurance; but the question arises whether it would have been anything like so serious as it was, had it not been for that twenty minutes' delay.

Fatal Accident at the Kidderminster Gas-Works.—At the Kidderminster Police Court, on Monday last week, the Deputy-Coroner (Mr. Hebbert) held an inquiry into the circumstances attending the death of Thomas Joseph Haddock, a bricklayer, which took place while he was repairing a retort at the Kidderminster Gas-Works on the previous Friday. The evidence went to show that deceased had repaired 18 out of 21 retorts. In one of the remaining three, there was a certain quantity of coke and ashes which had to be removed; and, instead of asking his labourer to clear them away, Haddock apparently started doing this himself. He was subsequently found dead in the retort. The Manager (Mr. A. Dougall) and several of the employees at the gas-works stated that they considered the repair of retorts perfectly safe employment. There was plenty of air, and no danger of foul gases—all the retorts being well ventilated. Dr. Moore said the deceased died from carbonic oxide poisoning; and he gave it as his opinion that there must have been some small cavity in the retort in which the gas was confined, and that Haddock, in clearing away the coke and dust, released the gas. The Coroner said it was obvious that there must have been some carbonic oxide gas in the retort, though the witnesses, who had had many years' experience, said such a case had never come to their knowledge before. It was for the jury to say whether the deceased was acting in a proper manner in getting into the retort before it had been cleaned out. The jury returned a verdict to the effect that death was due to carbonic oxide poisoning, and that there was not sufficient evidence to show how the gas had accumulated. They suggested that somebody should always be in attendance whenever anyone was in a retort, and that the retorts should be cleared before a man was allowed to enter them. The Coroner said this practically amounted to an open verdict. Mr. A. S. Thursfield, who represented the Gas Company, said they sympathized very much with deceased's widow and children; and he was gratified in being able to tell the jury that, as the Company insured their workmen, there would be £50 for the widow.

METROPOLIS WATER SUPPLY.

The London County Council and the Water Question.

At the Meeting of the London County Council last Tuesday—Sir A. ARNOLD in the chair—the debate on the water question, adjourned from the previous meeting (see *ante*, p. 838), was resumed. It will be remembered that the Parliamentary Committee of the Council submitted the following recommendation: "That, desiring that the supply of water in the Metropolis and the surrounding districts should be in the hands of a public authority, and with a view to a complete agreement with all parties concerned over the entire area supplied, the Council do invite Her Majesty's Government either to deal with the question themselves or to appoint a Royal Commission to do so." To this an amendment was moved by Mr. J. Stuart, M.P., and rejected by a majority of one, to the effect that the Council's Water Bills should be proceeded with.

Dr. COLLINS, in resuming the debate, said the result of the vote on the amendment at the last meeting was that the Moderates had succeeded in killing the Water Bills of the Council. The work of years had been destroyed and brought to nought by that one division. As far as he could understand the proposal of the Committee, it was that they were agreed that the County Council should not be the Water Authority for the County of London. It also seemed that they suggested another Royal Commission. He was not prepared to go to the Government, and ask for another Royal Commission on the subject. With regard to the assertion that the Council were not a fit body to become the Water Authority, he could not believe that Moderate members really desired the Council to abdicate their functions, and to belittle and degrade themselves in the eyes of London. He considered that the Council being the Water Authority for London was a *sine quâ non* of all progress in this matter. To test the meaning of the resolution, he would move the following amendment to the Committee's recommendation: "That, the Council having decided not to proceed with the suspended Water Bills, and desiring that the Council should be the Water Authority for London, it be referred to the Parliamentary Committee to report without delay the lines on which they suggest that the Government should be asked to legislate."

Mr. M'KINNON WOOD seconded the amendment. He remarked that the Moderate party, who had gained a victory in defeating the Water Bills, had not, up to the present, indicated any policy upon which they intended to proceed. The Progressives admitted that their policy had been killed; and they demanded that the Moderates, as the representatives of London, should show theirs.

Mr. BEACHCROFT, in opposing the amendment, said, in his opinion, to have proceeded with the Bills would have meant selling the ratepayers. Two alternatives now presented themselves—either to introduce a new Bill dealing with the whole question, or to take the course suggested by the Parliamentary Committee. This was a question which had passed out of ordinary municipal limits; and the proper plan was to ask the Government to take up the matter. But when they were asked by Dr. Collins to lay down the lines on which the Government should legislate, he joined issue with him. If they were going to Parliament, they should leave Parliament to adopt what course it thought fit. If the Council would sink party differences, go with its united force to the Government, and ask them to take up the question, they would do so; and he believed the first step the Government would take would be to negotiate with the Water Companies, which the Council ought to have done. If this course were taken, they would have a settlement, so far as the purchase question was concerned, probably satisfactory to all parties.

Mr. COSTELLOE asserted that the policy of the Moderates on this question, so far as it had been foreshadowed by Mr. Beachcroft, was one of ineptitude. They seemed to propose to go to the Government with a blank cheque of the London County Council. But the Progressives were not prepared to give a blank cheque—at any rate, as to the purchase price to be paid. Neither were they prepared to take a single step in the matter until it was fully understood that the Council should be the Water Authority for London.

Mr. H. CLARKE believed the Council had done excellent work on the Water Question, and had paved the way for negotiation; but he did not think the Council were the best body now to carry on these negotiations. The whole question was ripe for settlement. If the Council ultimately did become the Water Authority, it would have to raise a vast sum of money; and Parliament would not permit an unlimited time for the repayment of that debt. But London was not in a position to carry on its shoulders an increased rate of half a million a year, or anything like it; and for this reason he should oppose the amendment.

Sir J. LUBBOCK, M.P., expressed approval of the remarks made by Lord Farrer at the previous meeting, in which he pointed out that, under an open arbitration, they would have to pay much more for the water undertakings than they were worth; and they ought never to do that. The Parliamentary Committee last year struck out the clause on which they relied, and practically handed the Council over to open arbitration. He denied that the Moderates were in favour of increased expense in this matter; they had, on the contrary, persistently complained that the bargain proposed for the ratepayers would be a bad one. They had no interest in the Water Companies; and what action they had taken had been entirely in the interests of the ratepayers. Had the Council allowed the Finance Committee, as suggested by the Moderates, to make a report on the cost, they were confident the result would have been that the scheme would not have been proceeded with. The Progressives had, time after time, rejected schemes costing £100,000 or so, because they would be borne by the present ratepayers, and would benefit the ground landlords; yet now they were quite willing to undertake a scheme costing from £40,000,000 to £60,000,000, which would be borne by the ratepayers, and benefit the ground landlords. It was not necessary to discuss the policy of the late Bills, because the Council had already decided against them. He pointed out that they would have had the opposition not only of the Water Companies but the counties. He quite agreed that they should have power to obtain a supply of water from Wales, if necessary; but they need not go further than that at present. He was in favour of public control, which was the true policy, and not of purchase.

Other members having spoken,

The Earl of ONSLOW said that the Progressive party, after six years of power, had done their best to settle this question, and had failed utterly and signally. Mr. Costelloe had criticized the Moderate policy as one of ineptitude; but he himself was quite ready to confess that the Progressives had proved themselves incapable of dealing with the matter. There was one important consideration in connection with this subject, and that was the question of time, which was of the essence of the contract. If they introduced into the present House of Commons a Bill in any way similar to the Bills of last year, the only result would be the waste of another session. He had heard it said in many quarters that the object of the Committee's recommendation was to delay and shelve the question. For himself, and on behalf of those with whom he was acting, he emphatically repudiated that assertion. On the contrary, he believed that nothing but the treatment of the question by a strong and powerful Government in their own way would be in the least likely to bring about a settlement. He would be no party to going to the Government and asking them to settle the matter, and then telling them what ought to be done, when the Council had been unable to pass a Bill of their own. The Moderate party had produced a policy. They said this matter could not be settled by the Council, and that it was not likely any of the proposals which the Council might put before Parliament would be acceptable to the House. They said there was in power at the present moment a strong Government with a large majority behind it in the House of Commons, who, he believed, were fully impressed with the importance and urgency of this matter, and who were alive to the terrible disaster which was recently narrowly escaped in London; and if the Government would undertake this matter, they would settle it in a far shorter time than the Council possibly could.

Mr. STUART, M.P., supported the amendment, and claimed that, in order to preserve themselves from ridicule, the Moderates should indicate the main lines on which they intended to go to the Government, and should give the Council some idea of what they were proposing to ask the Government to do.

Dr. WHITE and Mr. H. H. MARKS, M.P., opposed the amendment.

The closure was then carried, and the amendment was put, and, on a show of hands, was declared to be lost by a majority of one.

A division was, however, claimed and taken, when there voted: For the amendment, 65; against, 56—majority for, 9. The amendment was then carried as a substantive motion.

Lord Farrer voted for the amendment.

On the motion of Sir JOHN LUBBOCK, M.P., seconded by Mr. WESTACOTT, an addition to the resolution was carried, instructing the Parliamentary Committee to print and lay before the Council the Memorandum by the Deputy-Chairman on the water question, with the exception of such parts, if any, as would in their opinion be prejudicial to the interests of the ratepayers.

A report was presented from the Water Committee by the Chairman (Mr. T. H. W. Idris), describing a visit which several members paid during the recess to certain water areas in Wales, with the view of examining sites for reservoirs for the future supply of London. It was resolved that the consideration of the report should be adjourned until after the Parliamentary Committee had reported on the water question.

The Deputy-Chairman's Memorandum on the Purchase Question.

The Memorandum referred to in Sir John Lubbock's motion has since been issued; and we give below the principal portions of the document.

Mr. Dickinson does not claim that his proposals are absolutely right; but he presents them as one view of a problem which is of such magnitude and importance to the people of London that, in his opinion, it cannot be solved equitably to the ratepayers by the simple expedient of ordinary purchase. He takes for granted (1) that the purchase-money allowed by an arbitrator would be such sum as would ensure to the shareholders an income not less than that they at present receive. This was calculated in 1891 as £37,000,000 of Metropolitan Consolidated Stock. (2) That the capital outlay actually sunk in the Water Companies' undertakings does not exceed £15,000,000; and that a large portion of this has long since ceased to be represented by any plant or material property; (3) that apart from any value or goodwill, &c., the actual material belonging to the Companies is not worth £10,000,000; and (4) that a scheme of new reservoirs at Staines would cost at least £10,000,000, and that a supply from a distant gathering-ground would cost £20,000,000.

In approaching the subject, Mr. Dickinson holds that the Council are entitled to look keenly at the position of affairs which has enabled the Companies to offer, at a price of £30,000,000, works which have only cost £15,000,000, and which are not worth to the purchasers more than £10,000,000. This position has been attained chiefly through the power possessed by the Companies of levying every five years increased rates on London houses. Parliament, says Mr. Dickinson, never intended to give the Companies this power; and the Companies themselves, when asking in 1852 for a power to charge on rateable value, not only did not contemplate any material increase thereon, but expressly represented to Parliament that their desire and intention was to have merely a simpler mode of obtaining the same profits. Is there then, he asks, any equity in the contention that the Companies are entitled to compensation on the basis of their present income? This contention, if put baldly, must reduce itself to the following: The ratepayers have paid to the Companies year after year more than they should have paid, and for that reason it is just that the ratepayers should provide now a capital sum sufficient to perpetuate to the shareholders their past exorbitant profits. He should have thought that justice would demand the reverse of this proposition.

Discussing the practical question, whether the Council should purchase the Companies on terms of arbitration, Mr. Dickinson takes the following things for granted:—

(1) That the figure an arbitrator would name would not be less than £30,000,000. (He does not see how any arbitrator could, under the present law, do otherwise than assess the value on the basis of present

income. Parliament could adopt another plan, but no other authority could do so.)

(2) That the report of the Royal Commission proves—(*a*) That the Thames and Lea will suffice till 1931, but not afterwards. (*b*) That a very large capital expenditure will be necessary to make the Thames and Lea water sufficient in quality and quantity. (*c*) That it is uncertain whether the scheme of reservoirs in the Upper Thames will provide sufficient water; the Commissioners themselves having over-estimated the amount of water which will be available at Staines for filling these reservoirs. (*d*) That a much-improved system of supervision must be inaugurated to ensure the quality of the water. (*e*) That no large quantity of underground water can be obtained near London. (*f*) That at any time the Thames may be a source of disease.

If these assumptions are correct, it appears to Mr. Dickinson that those who simply advise purchase, without any regard to the future, are taking upon themselves a very grave responsibility. In the event of an immediate purchase, the London ratepayer would find his charges for the same water materially increased. Estimating the financial result of the purchase at £30,000,000, to provide annual expenditure and repayment of capital, the present water-rates over the whole area of Water London will have to be increased by at least 30 per cent. The London ratepayer would not only have to supply his own 21 square miles with water, but also 500 square miles outside his county. London will, probably, be put under an obligation to supply all neighbouring districts in bulk at certain fixed rates defined by Parliament. These rates (owing to the powerful influence of the Home Counties) would presumably be fixed very low; and, moreover, the obligation would extend to delivering a perfect quality of water. These outlying districts will grow with rapidity. In the estimates of population, that of the County of London was estimated to increase from 4¼ to 6 millions; whereas the outer ring is expected to increase from 1¼ to 5¼ millions. It would be the needs of Outer London that would render a new supply obligatory; and then Inner London would be called upon to sink some £20,000,000 more for an object in which for itself it might have no interest. In a very few years, an expenditure of some £20,000,000 would be incurred in abandoning altogether the Thames as a source of supply, and the rates would be raised in respect of this by a further sum of 6d. in the pound. Mr. Dickinson thinks it is certain that if it happened that disease, originating in the valleys of the Thames and Lea, did succeed in reaching London, and causing an epidemic, there would be at once an irresistible popular demand for water from a new source. If it is not at once resolved to abandon the river supply, large capital sums will have to be expended in forming reservoirs in the valleys of the Thames and Lea. In this work much would be experimental. The report of the Commission, while stating that 300 million gallons a day could be obtained by storing the winter waters, gave no opinion as to whether the water in these vast reservoirs would be wholesome or not; and it is quite possible that, having completed these works, it might be found absolutely impossible to intercept and store sufficient water without danger to health, either in London or in the country surrounding the reservoirs. If the Council foresee the danger of their position, what reason is there for them to undertake the risk? It seems to Mr. Dickinson that those who should experimentalize upon the capacity of the Thames and Lea to supply water are those who formulated the proposals. He would leave the Water Companies to carry out the recommendations of the Royal Commission, and do all that is necessary for supplying London with good water for forty years. As shown by the Commission, their capacity for doing so would cease in 1931; and then the Municipality of London would take over the whole water supply. Mr. Dickinson thinks that Parliament should enact as follows:—

(1) That the powers and obligations of the Companies shall continue as at present until 1931, subject to (*a*) more efficient inspection as to quality, (*b*) obligation to raise money by auction, and (*c*) limitation of charges upon existing houses to the charges at present allowed.

(2) That the powers of the Companies shall absolutely cease and determine in 1931, and that in that year the Council shall take over their undertakings, or so much as it requires; paying therefor the actual value of the plant and materials so taken over.

(3) That at any time prior to 1931 the Council may agree with any Company to take over its undertaking.

The advantages of these proposals, Mr. Dickinson holds, would be—

(1) They would place the Council in a position to decide whether that body would continue to take a supply from the Thames and Lea, or should seek another gathering-ground free from considerations as to the throwing away of £30,000,000.

(2) They would define the rights of the Companies, and thus enable the Council, if they deem fit, to agree upon purchase at fair terms.

(3) They would not be unfair to the Companies, who would be left for forty years in possession of a valuable property—a property, indeed, depreciating in value, but depreciating gradually. It would not inflict the hardships upon individual shareholders which a sudden destruction of their property would inflict. For several years the market value of the shares would not alter to any great extent; and by a slight reduction in dividends, it would be possible to form a reserve fund towards providing for the capital loss.

(4) If, as seems probable, the Council were to resolve to obtain pure water from a distance, the necessary works would take many years in preparation and construction. It could be accurately estimated as to the epoch when these works could be completed. The Companies could only lay out money on reservoirs, &c., sufficient to carry them through until that date; and after that date the Council might provide the Companies with the new supply, or would probably come to an agreement for purchase.

If the Council were to resolve to adopt some such plan as the foregoing, the question of their action with respect to the Bills of the Water Companies now pending in Parliament would, Mr. Dickinson thinks, be simple. It would be necessary to oppose all these Bills—not with a view to their being thrown out entirely, but to obtain provisions in them which would ensure (*a*) that the Companies should take no more water out of the Thames or Lea than they can at present take without making provision for storage, as required by the Royal Commission; and (*b*) that all money raised should be raised by auction.

In conclusion, Mr. Dickinson urges that, with respect to the Thames Conservancy Bill, the Council should insist that a provision should be inserted which would prevent any Company taking any water out of the river which would cause less than 300 million gallons a day to flow over Teddington Weir. The duty of the Council would then be to prepare a General Bill for submission to Parliament, which would deal with all the London Water Companies in the way proposed, and, at the same time, if it deemed it advisable, might apply for power to commence the construction of works for a new supply.

The Quality of the Water in September.

In their report to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.) on the composition and quality of the water supplied in London during September, as ascertained by tests of samples taken daily on behalf of the Water Companies, Messrs. Crookes and Dewar say: Of the 175 samples examined, all were found to be clear, bright, and well filtered. The weather during September was in every respect remarkable; the rainfall in the Thames Valley having dropped from 2·66 inches (the average of 25 years) to 0·57 inch—leaving a deficiency of 2·09 inches. Rain fell on six days only; the bulk of it (0·39 inch.) on Sept. 6. This, together with the excess of sunlight, had a marked effect on the quality of the water, as can be seen by the following table:—

Average of the Five Supplies derived from the River Thames.

	Common Salt, per Gallon.	Nitric Acid, per Gallon.	Hardness, Degrees.	Oxygen required, per Gall.	Organic Carbon, per Gall.	Organic Carbon, per Gall.	Colour. Brown:blue
Aug.	1·994	0·740	13·09	0·039	0·093	0·108*	11·7:20
Sept.	1·980	0·685	12·97	0·032	0·081	0·098*	10·4:20.

* Maxima; all the other figures are means.

Bacteriological examinations of the filtered and unfiltered samples were carried on unremittedly throughout the month. We find that the average of raw unfiltered Thames water contained 2432 microbes per cubic centimetre, and the River Lea water 1710 microbes per cubic centimetre; whereas the filtered samples from the five Thames Companies contained only 62 microbes, and the filtered Lea water 73 microbes, per cubic centimetre.

GUERNSEY WATER-WORKS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Tuesday, at the Offices, Tokenhouse Buildings, E.C.—Mr. G. Snell in the chair.

The Secretary (Mr. A. C. Tulk) having read the notice calling the meeting,

The Chairman said the shareholders had been called together to pass a resolution to increase the capital of the Company to £45,000 by the issue of 2500 new shares of £10 each. During the past summer the demand for water for glass houses alone had been so great that it had been decided to relieve the drain upon the pure spring water supplies obtained from the wells, and establish an independent supply from quarries for these purposes. It was also proposed to erect additional pumping-stations, with powerful pumps capable of throwing upwards of 250,000 gallons daily from these new sources, with additional mains, and to construct a large reservoir in connection with the new system. The new works to be undertaken were estimated to bring in from 5 to 10 per cent. in dividends.

Mr. C. R. Hutchings furnished some particulars as to the supply of water furnished by the Company's wells, and also as to the prospects of additional water being procured from the quarries. He said the latter were in such a position that they could readily be connected with the new reservoir by the mains. One, known as the Du Val, contained 742,000 gallons of water; the next—Salt Pans—contained about 2 million gallons; another, called Baubigny, contained about 20 million gallons. This was a tremendous place, said to be from 60 to 70 feet deep. Then there was the De Lancy quarry, which contained about 4½ million gallons. In addition to these, they had Bennet's quarry, which had in it about 4 million gallons. Therefore, there was water in reserve in the quarries amounting to no less than 31 million gallons, which, at 200,000 gallons a day, would last 155 days, or six months.

After some questions by shareholders,

Mr. Hutchings moved—"That the capital of the Company be increased to £45,000 by the creation of 2500 new shares of £10 each."

Mr. W. H. Rose, in seconding the motion, said he had the greatest confidence in the success of the works.

The motion was carried unanimously.

CHESTERFIELD WATER SUPPLY.

A Serious Drought—Curtailment of the Supply.

Owing to the scarcity of water at Chesterfield, the supply has had to be restricted in the greater part of the borough ever since the 25th of August. In the town itself, the inhabitants have water for only five hours a day; and were it not for the existence of capital springs on the premises of certain manufacturers, operations in these places would be seriously hampered. Under these circumstances, it is only natural to find that Mr. C. E. Jones, Assoc.M.Inst.C.E., the Manager of the Chesterfield Water and Gas Company, has been "interviewed" on the matter by a newspaper representative. Mr. Jones confessed that the Company had only once before been in such a tight place in regard to the supply of water. He complained, like Mr. Bryan at the East-end, of the waste which goes on continually among consumers, even when everyone knows that the rainfall has been very limited. The cause of the present drought is the abnormally slight amount of rain; and to this must be added, as an important factor, the rapid growth of the population of Chesterfield during the past few years, in which time more houses and works have been put up than in scores of years previously. The buildings and population have gone on increasing; but the Company's gathering-grounds and storage capacity have remained the same. It might be concluded from this that want of

foresight had been exhibited by the Directors. But Mr. Jones shall furnish the explanation: "To meet the growing requirements of the area supplied by the Company, and to prevent a failure of the continuous supply experienced in some parts of it, they about a couple of years ago decided to seek powers from Parliament to enable them to increase the storage capacity and secure more water. The Corporation of Chesterfield and some of the local bodies combined in opposition to the Bill, on the ground, principally, of the enhanced water-rates which would have come into operation had it passed—charges which the Company said were absolutely necessary to enable them to obtain the capital requisite for the new works. The Parliamentary Committee did not consider the preamble proved; and they threw out the Bill. At the same time they required the Corporation to take steps within a year to acquire both the gas and water undertakings—rather more, perhaps, than the Corporation desired. A Board is now being constituted to take over the concern; but arbitration will, in all likelihood, have to be resorted to before the price at which it shall be acquired is settled. It is stated by those in a position to form an opinion, that fresh gathering-grounds will have to be sought, as Linacre will not be sufficient to meet the demands of the district. There is at the present time about 5 feet of water in one of the reservoirs, and about 8 feet in the other; but the water is low, and these figures do not by any means represent top water. The whole of this could be rushed through the mains in 24 hours; and the grave state of affairs may be seen when it is stated that there is only enough water now in the reservoirs to last a week, perhaps, at the most, at the restricted supply of five hours per day. It is quite possible that this is not the limit of supply that will be reached in case the clouds are not more kind. The scheme promoted by the Company before Parliament would have provided Chesterfield with a continuous supply for twelve or fifteen years to come, and made provision for 400 days' use. The present storage capacity of the Company is 156 million gallons. The gathering-ground covers 1300 acres; and by the hills about Chatsworth and other parts of the country farther away the clouds are denuded of a good deal of their water before Linacre is reached." Mr. Jones gave the interviewer his theory as to the recurrence of dry and wet seasons. It was that weather repeats itself, as does history, and that there are cycles of wet and dry seasons—the cycle extending over not seven but eleven years. He thinks we are now in the fourth year of a cycle of dry weather.

EXETER WATER SUPPLY.

Important Extensions of Works Suggested.

The question of the improvement of the water supply has lately been under the consideration of the Exeter City Council. The Water Committee reported at a recent meeting that the subject had received their serious consideration for some time past. Each succeeding summer showed an increased demand, and the time had arrived when there should be an increased supply together with an improvement in the filtration. A report by the City Surveyor (Mr. Cameron) estimated the demand for water thirty years hence at 2,550,000 gallons per day, or an increase of about 750,000 gallons daily on the present maximum demand. The total filtering area required was 70,000 feet; and there being no land in the vicinity of the reservoirs where filter-beds of this area could be constructed, he suggested that new ones be made at Pynes. He estimated the total cost of the works required at £16,245; including £5500 for new filter-beds, £1600 for engine and boilers, £4295 for a rising main, £2600 for an intermediate reservoir, and £1125 for an engine and boiler at Dane's Castle. If the alterations were made, there would be a reduction of £100 or £150 a year in the working expenses, and a plentiful supply of properly filtered water. It would be worth while to consider what gain could be effected by having the principal pumping-station under the same roof as the electric lighting works. Though it would not be possible to take refuse to any of the pumping-stations, no objection could be raised against bringing the water in a closed conduit to a place where sifted town refuse could be used for raising steam. If a site for such a station were selected in Exe Street, a new 15-inch main would have to be laid, involving an additional outlay of not more than £1000. Instead of suggesting the construction of a destructor, he recommended the making of producer gas; but such a scheme as this would need further consideration, though this need not delay the resolution to construct the filters and proceed with other parts of the works. The Water Committee recommended that they should be authorized to obtain opinions from gentlemen of recognized experience and authority upon the suggestions of the City Surveyor. Mr. Fulford, the Chairman of the Water Committee, in moving the adoption of the report, pointed out that the expenditure would amount to £20,000 or £22,000; the Surveyor's estimate being £16,500 without the acquisition of land, wages, and contingencies. Mr. W. Wreford seconded the motion; and it was carried.

PLYMOUTH WATER SUPPLY.

Considerable discussion took place at a recent meeting of the Plymouth Town Council on a motion challenging the decision of the Water Committee to complete the construction of the Burrator reservoir without the intervention of a contractor. Mr. J. T. Bond, the Chairman of the Water Committee, said the resolution no doubt pledged the Council to the expenditure of a large sum of money; but it was part of an expenditure sanctioned so long ago as 1892. About one-half of the whole sum likely to be involved had been laid out. The Committee had so far done the whole of the work themselves, by the sanction of the Corporation; and it was a piece of work of which all connected with it, as well as the ratepayers, were distinctly and justifiably proud. The pipe-line for Burrator to the service reservoir at Hartley had been completed by their own labour, and under the direction of their own staff, well within the estimated amount. The land for the reservoir had been bought at less than the estimate; and with half the work done, the total sum expended was below the mark. What had been accomplished was the best possible evidence why the recommendation of the Committee should be adopted, and a consistent course maintained from start to finish. A contractor would primarily work for a profit; the Corporation would, of necessity, primarily work for a perfect and lasting memorial to commemorate their labours. He was satisfied that ninety out of every hundred ratepayers were in favour of the Corporation doing the work; and the Committee of the Operative Stonemasons' Society had memorialized the Committee in favour of this course. Another reason for going forward on the lines proposed by the Committee was that any change now would involve negotiations which would cause serious delay of the work. Mr. J. A. Bellamy asked whether Mr. Mansergh, the Consulting Engineer to the Corporation, had expressed any opinion as to the desirability of the Corporation constructing the masonry dam, and also with regard to the employment of a firm of surveyors to get out the quantities for the work. Mr. Bond replied that Mr. Mansergh was strongly of opinion that the Corporation should do the work at Burrator themselves. The other question was one of detail, which could well be left to the Committee. It was merely a matter of expenditure involving a sum of £300 to £500. Alderman Shelly said the question of whether or not they should do the work themselves was of great importance; but, after the opinion expressed by Mr. Mansergh, and the explanation of Mr. Bond, he was satisfied on this point, and advised the withdrawal of the motion. After some further remarks, this course was adopted.

THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD WATER COMPANY.

A short time ago, the City Engineer of Newcastle-upon-Tyne (Mr. W. G. Laws, M.Inst.C.E.) visited the new works of the Newcastle-upon-Tyne and Gateshead Water Company now in progress, with Mr. Charles Hawksley, M.Inst.C.E., their Engineer. The whole of the works—from Ramshope, near which place the Catcleugh reservoir begins, to Woodford Bridge, where the Rede water is delivered into the old aqueduct leading from Little Swinburn to Hallington—were inspected; and Mr. Laws has since presented a report thereon, from which we make a few extracts.

Commencing at Ramshope, near the head of the proposed reservoir, the work now in progress is that of exploring the site by cutting trenches across the bottom through the loose river drift and down to the water-tight strata, so as to prove their continuity. There are five or six of these trenches now open. On the site of the proposed dam at Catcleugh, the same operation of proving the depth of the water-tight stratum below the surface, and its thickness, is being carried on, but in rather a different manner—viz., by the sinking of trial pits on the line of the puddle trench down to, and in most cases for some distance through, the water-tight shales. The deepest of these pits is about 102 feet from the present surface; and some of them extend to about 40 feet below the level of the river-bed. This work of exploration is always, or ought always to be, done on the site of a projected dam; and, in this instance, it is being carried out with unusual care and completeness. There are eleven pits at present sunk, or being sunk; and the work goes on night and day. About 300 men are employed, and preparations for a much larger number (in the way of huts, &c.) is being made; so that as soon as the exploration is so far complete that the exact position of the puddle trench can be fixed, there need be no delay in pushing the execution of the work with all safe speed.

A short distance above the site of the reservoir dam, and so far as to be clear of the present work, a small timber dam about 3 or 4 feet in depth has been constructed across the river-bed. In this dam are formed two submerged openings, or slot gauges, about 21 inches below the top. These openings are of such a size that, when submerged to the depth of a foot, they will pass, if both be open, 4½ million gallons per day; and if the smaller one only is open, 2 million gallons. These are the respective quantities of compensation water to be delivered to the river at the different seasons—viz., 2 millions for the nine months from May to January, and 4½ millions in February, March, and April. Above the dam a temporary intake and recorder-house is constructed, with a grid next the river and wire-gauze strainers to strain off floating matters, and a weir of which the crest or upper surface is just a foot above the level of the submerged gauges in the river dam already described. The effect of this arrangement is that, so long as the water in the river is less than the compensation water required by Act of Parliament to be discharged during the season, it all passes through the gauge openings in the river dam; and so long as its level never rises more than a foot above these compensation gauges, no water can get over the intake weir into the main. So soon as the water in the river exceeds 2 or 4½ millions, as the case may be, the level in the dam rises higher than a foot above the gauges in the dam; and consequently water falls over the recorder-house weir and into the intake of the main until this carries off its full capacity—say, 8 millions.

The permanent 30-inch pipe is now laid from Catcleugh to Brig, a distance of 13 miles; and from Brig down to Woodford Bridge, another 13 miles. At Brig it is intended to construct a break-pressure reservoir. This will be almost exactly central between Catcleugh and Woodford Bridge; and it is also on the hydraulic gradient—that is, on a line drawn on the section from the point of intake to the point of delivery. The point of intake at Catcleugh outside the reservoir will be about 730 feet above Ordnance datum; the point of delivery to the old aqueduct at Woodford Bridge is 530 feet above the same datum; and the Brig break-pressure tank will be at 630 feet. The total fall of 200 feet is thus divided into two parts of 100 feet on each 13 miles of pipe; making the head on each section the same, and therefore the delivery practically equal. The proposed water-level in the Catcleugh reservoir, when full, is 810 feet above Ordnance datum; but as the intake-pipe does not enter the dam, but takes its water from a gauge-tank outside, which is open, there will be no variation in the head of water on the main from any change in the water-level in the reservoir as it is more or less full.

From Brig downwards, there is nothing to remark upon until Woodford Bridge is reached, where the water from the Rede is delivered into the Swinburn and Hallington aqueduct at a point about half a mile below the Little Swinburn reservoir. Here a gauge-house is being erected, with measuring weir and recording apparatus, similar to, and as complete as, those at the Whittle Dene filters. By this apparatus, it will be possible not only to measure and record the quantity of water coming down from Catcleugh, but also (after it has been rated), inferentially, the amount passing down from Little Swinburn and Colt Crag. At the time of the visit, there were 2½ inches of water on the gauge weir, which would correspond with about 1½ million gallons passing over. It is estimated that, while the Rede was in flood, as much as 10 millions have passed over per day; but that the average discharge has been about 3½ millions. It is possible that, the pipe being new, 10 millions a day might pass; but it would not be safe to reckon on more than 8 millions when it is in regular work. The latter part of this season has been favourable; so that since June there has been water enough in the Rede to provide the compensation water, and an average of (say) 3½ millions besides.

Assuming that it will be possible to reckon on an average, over the year, of 3 millions, this would supplement the present storage by about 1000 million gallons, and certainly should enable the Company to commence the season with full reservoirs, which has not been the case since the winter of 1892-3. This should make them secure until the Catcleugh reservoir is complete, when the storage will be roughly 5000 millions, backed by any surplus of the Rede over the ascertained amount to be delivered to the river after January, 1902. By that time it may be hoped that the efforts of the Company to check leakage, and the joint efforts of the Corporation and the Company to check waste, will have reduced the consumption per head to a more moderate figure.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This is the season when candidates for seats at municipal boards make their onslaught upon the communities. Generally speaking, those of them who are possessed of the highest wisdom say least; while those with the least wisdom, are very voluble. It is among the latter that the men of one idea—the faddists—who want the Corporation to build workmen's houses, to find work for the unemployed, and such like matters, are to be found. With them we have nothing to do here; but there is a type of candidate, in towns where the gas supply is in the hand of a company, who thinks to find favour with the electors by denouncing the company. In towns where the gas supply is in the hands of the corporation, if he be a sitting member, he usually defends the policy of the committee who manage the gas-works; and if he be a new candidate, he attacks them. Whichever way he inclines, his talk is, as a rule, quite ephemeral; for after the elections are over there is seldom any public result from it. But no falsehood can be told without being followed by pernicious effects; and no misrepresentation can be made without doing harm, it may be to the man himself, by lowering his own self-respect, but almost to a certainty it will be harmful to the gas consumption, in consequence of the prejudice it creates in the minds of individual consumers. There is another occasion when public men lower their dignity; and that is when there is a proposal on foot for the acquisition of a gas company's undertaking. To depreciate the article you wish to buy is a fixed point in the creed of many commercial men. Provided it is done fairly, there can be no objection; but if otherwise, evil consequences result. In the horse market, such practices can be, and are, indulged in with impunity; but in the case of a public question, they are apt to have after-effects. Take the case of the Falkirk gas transfer. There were some who could not sufficiently run down the Gas Company. Now it is seen that all their abuse was a mockery; and they have had to "hide their heads." The other evening Provost Griffiths, to whose high talents I bore testimony last week, intimated his intention to retire from public life, and stated that he had been ostracized from the Committee who had charge of the taking over of the gas undertaking for venturing to assert that the cost would be from £60,000 to £80,000. He went on to say that they had spent over £8000 in the process of acquiring the undertaking, and that they had paid a higher price than they would have done had they arranged the matter in Falkirk rather than in London. The Provost is right. I think I told them more than once, while they were negotiating, that they were going the wrong way about the matter, when they set up hostility in the Gas Company instead of approaching the subject with an open mind and in a friendly spirit. These remarks may be taken as a warning to those who may be contemplating the acquisition of local gas undertakings.

That this warning is not altogether unnecessary, will be apparent when I state that at Brechin, where there is a proposal in the air (though not in very definite form) for the taking over of the Gas Company's undertaking, Provost Vallentine told the Town Council that he thought they ought not to pay their gas account, because the gas they had been supplied with for some time was simply abominable. Whereupon several members of the Council gave voice in the same direction, as if they were a pack which had just found a good cry. One said it was a scandal to any civilized city (the people of Brechin always speak of the place as a city, on the ground of some eminence which has palpably "long since passed away"). Another said that as the quality of the gas was at least 50 per cent. below what it ought to be, he intended to deduct 50 per cent. from his account; and he would recommend all other consumers to do the same. Still another said the gas was not equal to two candles. Then rose one member, who is evidently acquainted with the affairs of the Gas Company, and who informed them that the oil-gas retorts at the works had been taken out and the new ones had not been got into work; and that the Directors were as much annoyed as anyone at the bad quality of the gas. There would, in this case, seem to have been some foundation for the complaints; but it could only have been for a few days, and was not worthy of the dignity of a full-dress discussion in the Town Council, unless there had been a prior feeling towards a showing up of the Gas Company. This appears from, as much as anything, the fact that no resolution on the subject was arrived at, or even submitted.

The subject of the taking over of the Gas Company's undertaking is at present agitating to its very depths the community of Dunfermline. I must say that the agitation in this case has started more fairly than in any instance with which I am familiar. The proposal is that the Burghs Gas Supply Act of 1876 shall be adopted. The Council have already agreed to its adoption, and are waiting, according to statute, till the electors shall have considered it. In these circumstances, I regard it as highly creditable to Provost Walker that he, before the annual meetings of the electors, called the community together in order that he might explain the situation to them. As a further instance of his desire to deal with the subject fairly, I may state that, after calling the meeting, he discovered that the place at which it was to be held was engaged, and altered it to a smaller hall, which was found to be altogether incapable of containing the number who wished to attend; and that then he postponed a visit to London, at great inconvenience, in order that the meeting might be held before the meetings of the electors to choose their representatives. The meeting took place on the succeeding night, and was attended by about 1200 persons. Provost Walker made a long speech in favour of the adoption of the Act. I may say that Provost Walker, who is a large manufacturer, employs electric light in his works; and is satisfied with it, though it costs him one-half more than gas did. When this is considered, his fairness of mind will be the more appreciated. He threw no stones at the Gas Company. From beginning to end of his speech, there was not a single complaint of anything they have done. I was particularly pleased with the following passage: "They need not expect to secure the works below their real value. He knew that there were peculiar ideas regarding the Gas Company's shares; but, as was done in every other business, the shareholders took a part of the money they made in interest, and spent it in extending and improving the works, until they had a larger capital than they originally had. It would be neither right nor just that they should expect to buy the works at their original value. If a man saved £50, and then started business and made £500, would it be a right thing to say to him—'You must hand over your business to me for the £50 capital you started with, because we will not recognize anything you have made since'?" That is the right principle to begin negotiations with. Provost Walker then went on to tell them the folly there would be in attempting to start rival works, which, he said, might result in their ruining the Gas Company; but it would cost the town a great amount of money. Then he dealt with the possible objection of the electric light superseding gas, and said he had seen it stated that they wanted to force the matter on the community because gas was on the backward track. But he had written to a number of places where electricity had been introduced, and the replies showed that in every one of them except Brighton, the gas consumption was increasing. Hundreds of people in Dunfermline, he was told, did not use 1000 cubic feet of gas (3s. 7d. worth) in a year. It would cost those people as much for globes (lamps?) if they used electric light, as they paid for gas. He thought it would take a much bolder man than him to introduce an installation of electric light into Dunfermline. He advised them to adopt the Act, not necessarily in order that they might at once take over the Company's undertaking, but that they might be in a position to negotiate. A discussion followed, in which the opinions expressed were in accordance with the Provost's view; the only additional matter introduced being that they should not pay a fancy price, which was quite reasonable. The meeting was simply one for discussion; and the subject was laid before the electors at their annual meetings on Wednesday night. Nearly everyone spoke on the subject; and there were, I think, only one or two who did not favour the adoption of the Act. It came out, however, in some cases that the desire to adopt the Act was founded on the notion that with it in their hands they would have a compulsitor with which to approach the Gas Company in the matter of the charge for public lighting. This is not so satisfactory, and shows that everyone in Dunfermline is not so upright in public matters as Provost Walker. One gentleman entered upon the subject of price, which he said might be, by one method of calculation, £75,000, and by another method £100,000. Two gentlemen thought it was too late in the day to acquire a gas undertaking; but they would not oppose the adoption of the Act. It is evident that there are mixed opinions on the subject; and the further progress of the movement will require to be watched, because, with the notions prevailing, there is danger of the Corporation getting into trouble.

The progress of the gas industry at Hamilton is a fertile subject of comment in the Corporation, by whom the gas-works were bought in 1861. During the past week several ward meetings were held, at which gas affairs figured prominently. Mr. Purdie, as a member of the Gas Committee, was able to speak as with authority on this subject. He contrasted the figures for the years ending 1892 and 1895. In the former year, the quantity of coal used was 7515 tons, and this year, 7772 tons; while the output of gas was respectively 61,738,900 and 80,623,100 cubic feet. The tar and liquor made in the former year amounted to 372,965 gallons, as compared with 546,458 gallons; and the quantity of coke sold in 1892 was 1353 tons, against 3067 tons in 1895. There was thus an increase of 257 tons of coal used, while there was an augmented make of gas to the extent of 18,884,400 cubic feet. In respect of tar and liquor sold, there was an increase of 173,493 gallons; and the increase of coke sold was 1714 tons. Through the reduction of 10d. per 1000 cubic feet in the price of gas last year from the 14th of March, the revenue for this year had been reduced to the extent of £2725 11s. 4d.; but, notwithstanding this great reduction, they had a gross profit for the year ending March, 1895, of £2408. The total revenue for the year was £10,282, which was upwards of one-half of the total revenue of the burgh exclusive of the Common Good. Referring to the last enlargement of the works, he remarked that there was an Engineer of high standing (Mr. Barr, of Glasgow) appointed to superintend the works. Now, however, with far more extensive additions and alterations—in fact, a new gas-works—Mr. Ewing, their most esteemed Engineer and Manager, was doing all the engineering work in connection with the new undertaking, and, to all appearance, in a thorough and most efficient manner. This would be a saving to the town, perhaps, of nearly £1000, because the cost of the works, when completed, would not be much less than £20,000; and, beyond

that, the salary of an inspector had been saved. The whole work of the management was, therefore, surely worthy of very fair credit. Bailie Hamilton, the retiring representative in the Second Ward, gave credit to the Convener of the Gas Committee (Mr. Brown) for doing his work faithfully and well, in conjunction with their able and energetic Manager. At the same meeting some remarks were made on the gas affairs of the burgh which were in a very different key, as might be expected when it is mentioned that the speaker was Bailie Tainsh, who seems to like the *rôle* of objector-general to almost everything that is done by the Committee and the Manager. His criticism was very fully replied to at the meeting of the Third Ward by Mr. Brown, whose constituents thoroughly enjoyed his free handling of Bailie Tainsh and his co-objectors to the extension of the works now in progress.

Dr. M'Lachlan, a Town Councillor of Dumbarton, has just been telling his constituents some interesting facts as to the progress of the gas industry in the town. In 1864 the price of gas was 6s. per 1000 cubic feet, and over and above that, there was a charge for meters. At that price the gas did not pay, but left a considerable deficiency. From 1875 to 1895, under the present management, there was a clear profit on the gas of £1000 yearly. During that time, gas in Dumbarton was cheaper than in any other town similarly situated. The present price of gas in Dumbarton is 3s., with no meter-rents, and 2s. 5d. for public lighting. From 1875 to 1895, £14,000 has been obtained in the shape of gas profits and applied to the reduction of capital, *plus* £6000 to the Common Good, which had gone for the upkeep of the Clyde Pier and the public park. This spoke volumes, he said, for the management of the local gas-works.

The Forfar Gas Corporation have fallen on evil times; but these are of their own making. Mr. Forbes Waddell, the Manager, has been only a short time in his position; but he has done good work for the Corporation. I know I may wound the feelings of some gas managers, as I have done before on this subject; but, in order to protect Mr. Waddell, it is necessary to state that he got the works in a condition which required a good deal of "redding up." In this, he has received only divided support. The works were over-staffed with workmen; and when he was urged to reduce his wages bill, and attempted to do so, some of the Commissioners objected. He got his way then, however, and things looked as if they had settled down; but the trouble has broken out again. There were two foremen in the works. Mr. Waddell thought that one, with himself in active superintendence, was sufficient; and as he was not satisfied with one of the foremen, he reduced him, offering him a situation to break coal. My reading of what took place after that is that the man, forming a hostile spirit to Mr. Waddell, began to talk outside the works about certain pipes and bends which Mr. Waddell had sold, and about the quantity and quality of tar and liquor. For that, Mr. Waddell dismissed him. The workman then presented a petition to the Corporation for reinstatement. This petition was considered by the Corporation on Monday. A scene of great and lamentable disorder ensued, which it would be impolitic to enter into. It is sufficient to say that the proceedings were not conducted with any approach to judicial forms—in fact, the members seemed to have made up their minds on the one side or the other, and to have come prepared for a field night. The supporters of the workman endeavoured to make out that Mr. Waddell was lax in the matter of not entering coal unpaid for in the balance-sheet; of entering the pipes at 6s., and then selling them as old iron for 1s.; and in representing that there was more tar and liquor in stock than was actually the case. If these things were to have been charged against Mr. Waddell, they should have been brought up and disposed of separately—they are of sufficient importance for that—instead of being mixed up with a question of dismissing a workman. But, of course, that was not the card they wished to play. It is sufficient to show that their charges were not serious that no proposal was made to have them so dealt with. Mr. Waddell's explanations were that the coal account had not come in; that the pipes were sold because they were old, and time was wasted in fitting them; and that he informed the Commissioners of the quantity of tar and liquor, and that it was under quality. As the Commissioners themselves did not seek to substantiate the allegations, it may be taken for granted that Mr. Waddell was correct. This being so, the true nature of the proceedings comes out; they were simply an attempt to break the authority of the Gas Manager, in the interests of the workmen. This much appears from the statement very irregularly made by one of the workmen, that he was never more disgusted in his life than he had been under Mr. Waddell. The workmen wish the works to revert to the easy ways of old times—which, of course, will not do—and they are able to move some of the Commissioners to their view. It is truly disgusting to think that this should be the case; but so it seems to be. These men have not yet secured a majority in the Corporation; but they are very near it. When a division was taken as to whether this workman was to be reinstated or not, six voted in favour of reinstatement, and seven against. Provost M'Dougall, who headed the majority, put it very sensibly when he said that the management of the works must be left entirely in the hands of the Manager. That view prevailed this week; but notice of motion was given to the effect that the power to dismiss men should be taken out of the hands of the Manager, and placed in the hands of a Committee. To do so, would be more than folly; and it is to be hoped—not for Mr. Waddell's sake alone, but in the interests of other gas managers—the motion may never be adopted.

The shareholders of the Cupar Gas Company met on Thursday, and resolved to form the Company into a limited liability one. The proposal was made by the Chairman, and was opposed; but the opposition only counted 17 votes, as compared with 153 votes in favour of the change.

Last night there was an explosion in an electric light box at the corner of West George and Renfield Streets in Glasgow; and the cover of the box was blown off. A lad who was passing was struck by the cover, and was so severely injured that it was necessary to take him to the Royal Infirmary.

The financial statement of the Perth Water Commissioners for the year ending Sept. 30 shows that the income amounted to £6473, and the expenditure to £3242—showing an excess of receipts of £3231. After wiping off the debit balance of £294 at the beginning of the year, providing £1505 for interest on debt, £1021 for instalment of debt to Insurance Companies, and £218 for the sinking fund, there is a balance on hand of £192. Of the income, £6175 was received from assessments, and £297 from rents. The principal items of expenditure were: Wages and salaries, £854; coal and gas, £645; engineer work, £210; pipe-tracks, £101; meters, valves, &c., £98; expenses of electric lighting, £76; management, £429; public burdens, rents, feu-duties, £543. During the year, £500 of the sinking fund was applied in payment of bond; and the sum at the credit of this account now stands at £232. The total amount of the debt at present is £39,178. The amount of the assets is stated at £64,901, of which £62,573 is put down as value of the works; the remainder being cash in bank and in Treasurer's hands.

On the instruction of the Wishaw Police Commissioners, bores have been put down to ascertain if a suitable supply of water for the town could be got in the neighbourhood. The Commissioners, at a meeting some time ago, differed as to the quantity of water obtained from the bores; and they then asked Mr. J. M'Callum, of Motherwell, to make a gauge of them. This has now been done, and Mr. M'Callum's report brought out a quantity of about 30,000 gallons per day less than had been previously reported. Samples of the water have been analyzed by Dr. Tatlock, of Glasgow, who has reported that the water is hard, being from 16·95 to 21·80; and that it also contains iron in solution, becoming turbid on standing, and depositing flakes of brown oxide of iron. It also contains a considerable amount of both free and albuminoid ammonia, which, though it may not be from sewage sources, is nevertheless objectionable. The water from one of the bores is free from ammonia, but it is the hardest of all. The Commissioners resolved not to proceed any further with the boring.

The Police Commissioners of Arbroath have for a number of years had trouble with the water supply to the town, which is pumped. To pump water for town supply in Scotland, where there is so much water which could be got by gravitation, looks almost absurd. Arbroath is, I think, the only town in Scotland of any size where it is done; and I suppose the reason has been that a considerable distance would have to be gone before a suitable elevation could be got for a water supply. The matter has been forced upon the Police Commissioners, however, by the failure of the supply from the wells. Last week the Commissioners had before them a report by Mr. J. Wilson, of Edinburgh, on the water supply, in which it was stated, as the result of three months' continuous pumping night and day, that the supply from the Nolt Loan Wells and from the experimental well at Warslap had diminished—the former from 171,000 to 141,000 gallons per day, and the latter from 211,000 to 130,000 gallons. The report continued: "As sufficient water for the wants of the town is not being got at present from the Nolt Loan Wells, it would be necessary to supplement the supply by pumping at the Warslap Well. I think it is unnecessary, however, to carry the pumping tests any further; and the Commissioners would require to consider whether it would not be advisable, as formerly suggested, to go for a gravitation scheme, and after its completion to abandon the pumping altogether." After discussion, the Commission, in accordance with a recommendation of the Water Committee, resolved, by a majority of 10 votes to 8, to approve the report.

A Ghastly Discovery at Beckton.—The Central News says: "The skeleton of a man has been found in a coal heap at the Beckton Gas-Works. It is believed that it had been there since the coal was stored about nine months ago."

The Water Scheme for Malvern Link.—The result of the poll in the Malvern Link district upon the water scheme which the District Council propose to carry out is a majority of 304 votes in its favour Some particulars as to the scheme proposed have already appeared in the JOURNAL (see *ante*, p. 645).

Alleged Deficient Water Supply in the Rhondda Valley.—Arbitration proceedings have been commenced (and adjourned till the 8th prox.) in the matter of a complaint by the Ystrad District Council—acting under section 52 of the Public Health Act—to the effect that the Ystrad Gas and Water Company were not willing and not able to supply the district with a proper and sufficient supply of water for all reasonable purposes for which they were required to so provide by the local authority. The matter was originally referred to Mr. G. Chatterton, M.Inst.C.E., for the Council, and Mr. G. H. Hill, M.Inst.C.E., for the Company; but these gentlemen having failed to determine the differences that exist, the appointment of Sir Benjamin Baker as Umpire was agreed upon. The proceedings were private; but it is reported that Mr. Cripps, Q.C., opened the case at great length for the Council, after which evidence in support of their contention of insufficient supply was given. A large number of expert witnesses are yet to be called—including Mr. Deacon and Mr. Middleton.

Labourers' Wages at the Leeds Gas-Works.—The labourers in the service of the gas mains and meters department of the Leeds Corporation are agitating for an increase of remuneration. About 150 men are interested in the movement. Some of them, it is stated, have been receiving as little as 4½d. an hour, which they contend is too little for the class of work they have to do. The subject came up for discussion at a recent meeting of the Gas Committee, when it was decided to leave the consideration of it to the new Committee which will be appointed after the elections. The officials of the local branch of the Gas Workers' and General Labourers' Union (of which most of the labourers are members) wrote, however, urging that the Committee should forthwith give them an answer to their demand. A special meeting of the Gas Committee was in consequence held last Friday. A deputation from the labourers, headed by Mr. T. Paylor and Mr. Smith, of the Gas Workers' Union, attended, and pleaded their case. After a sitting of a couple of hours, the Committee decided to adhere to their former resolution. The Chairman, however, informed the deputation that they would recommend the new Committee appointed after Nov. 1 to favourably consider the men's demands, with one exception. Messrs. Paylor and Smith informed a meeting of the men on the same day of the promise the Committee had given. It was decided to take no further action in the matter at present; but to await the decision of the re-constituted Gas Committee.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 26.

Sulphate of Ammonia.—The larger demand for covering contracts, referred to in the last report, led to a further advance early in the week. But pressing requirements being satisfied, the orders have dropped off; and, in consequence, the market has assumed a quieter tone, with a return to last week's prices—the closing quotations being £9 to £9 2s. 6d. per ton f.o.b. at the ports. From this, it seems pretty clear that the interest of the operators is still in low prices. Consumers generally did not follow the advance to any great extent; and their attitude is unchanged. They would still be buyers at a shade under closing quotations for prompt delivery; and for forward delivery, they would pay a moderate premium. But prices asked for delivery over spring months are not sufficiently tempting to induce much business.

Nitrate of Soda is quiet on spot; but, in the forward position, there is a better feeling, notwithstanding heavy October shipments. On spot, fine quality may still be had at 7s. 9d. per cwt.; but for refined quality, late autumn shipment, something over 8s. would now have to be paid.

LONDON, *Oct.* 26.

Tar Products.—Benzols maintain the firmness noted last week. An unsuccessful effort, however, has been made by the Continental buyers to depress benzol. Important business has been done at 1s. 3d. and 1s. 2d. respectively for 90's and 50's, which are the best prices that have been obtained for a very considerable time. Gas manufacturers are now recognizing the great superiority of benzol over all other carburettors for enriching gas; and in cases where deposited naphthalene is troublesome, the use of benzol is of great value and extremely effective. There is a good deal of inquiry for anthracene; and notwithstanding the unscrupulous attempts to wreck this product, it is in better demand and value than it has been for some time. Both buyers and sellers will be interested to know the Tar Products Sales Committee have been unanimously renewed for a further long period. Pitch is not quite so firm; and as the large make is now coming on, it is not unlikely prices may be easier. Naphthalene salts are in excellent request; and a fair business is being done in carbolic acids. The following values have been realized during the week: Tar, 19s. to 23s. 6d. Pitch, 35s. west coast; 38s. east coast. Benzol, 90 per cent., 1s. 3d.; 50 per cent., 1s. 2d. Solvent naphtha, 1s. 2½d. Toluol, 1s. 3d. Crude, 30 per cent., naphtha, 5d. Naphthalene salts, 25s. to 40s., according to quality. Cresylic acid, white, 1s. 2d.; brown, 10½d. Carbolic, 60's, 1s. 6d.; 75's, 1s. 9½d. Anthracene, "A," 1s.; "B," 9½d.

Sulphate of Ammonia is in good request at the advanced prices. Buyers have no doubt held off as long as they possibly could; and this accounts for the heavy shipments which are now taking place. The stocks held by makers are extremely low; and it is reported, on the best authority, that the large Continental consumers have practically no stocks at all. Extensive contracts have been made during the week for early delivery at £9 to £9 5s., less 3½ per cent., according to port of delivery. Gas liquor is quoted at 7s. to 8s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the close of the month, there is here and there some slight levelling-up in prices, to the extent of 3d. to 6d. per ton, where they have previously been exceptionally low. This, however, is confined chiefly to some of the medium qualities; and so far there is nothing approaching any general upward move in prices, as supplies are still too plentiful, and pits have barely yet got on to full time. The winter weather during the last week has necessarily given more activity to the demand for the better qualities of round coal, suitable for house-fire purposes, in which there is a fair business doing; but the lower qualities of round coal, for iron making, steam, and general manufacturing requirements, still hang upon the market, with supplies excessive. At the pit mouth, best Wigan Arley remains at 10s. to 10s. 6d. per ton; seconds Arley and Pemberton four-feet, 8s. 6d. to 9s.; common house coals, 7s. to 7s. 6d.; and steam and forge coals are not fetching more than 6s. to 6s. 6d. A very moderate business comes forward in engine classes of fuel; and some collieries report a scarcity of supplies. But this is by no means general; the quantity of slack offering on the market being ample for requirements, with prices not more than maintained at 3s. to 3s. 6d. for common, to 4s. 6d. and 5s. per ton for better qualities. The increased requirements for slack suitable for coking purposes may, however, take a good deal of engine fuel off the market, and thus tend to harden prices; and colliery proprietors in some cases are chary about contracting forward. For shipment, business continues very limited; and ordinary steam coal has been sold at as low as 7s. per ton delivered at the Garston Docks. Better qualities of steam coal are quoted at 7s. 6d. up to 8s. per ton delivered at the Mersey ports.

Northern Coal Trade.—Through the week, the variation in the northern coal trade has been more in the volume of the trade than in the price; and this is due largely to the change that usually takes place when the ports of the North, and especially in the Baltic, are beginning to close. The effect has naturally been most marked in the steam coal trade; because the increase in the demand for gas and household coal for the inland more than counterbalances any falling off in the exports of those qualities. The price of best Northumbrian steam coal has not been much affected by the variation in demand; and it is to-day 8s. 6d. per ton f.o.b. Second-class steam coals are quoted 8s. per ton also f.o.b. The irregular working of some of the collieries has reduced the output of small steam coal, and made it rather scarce; so that the price of this quality is decidedly firm at 4s. per ton. In regard to manufacturing coals, the contracts have just been signed for the largest quantities used by any one local company; and they are substantially at the same prices as those that will expire with the year—one or two of the lots showing an advance of 1d. to 1½d. per ton only. Gas coals have steadily maintained their prices; and as the large deliveries will be further increased with the beginning of November, it may be supposed that the rates will be stiffened for any additional quantities. At present, the price varies as much as from 6s. 6d. up to 7s. 3d. per ton f.o.b.; but it is well known that the deliveries are under contracts at much lower prices—from 6s. to 6s. 3d. per ton f.o.b. Coke is dearer, owing to the larger demand from the blast furnaces, both locally and for the north-west; and thus, though the Baltic demand is less, the price is on the whole rather higher—as much as from 14s. to 15s. per ton f.o.b. being asked, while 14s. 9d. has been actually paid for shipment. Gas coke varies with different companies. Some of the inland producers have large stocks; but at the waterside, the large demand for shipment lessens the stocks, though production is increasing. For this use, the price is about 10s. per ton f.o.b., or perhaps equal to 8s. 6d. per ton at the works.

Scotch Coal Trade.—There is, if anything, an improvement in the demand for coal; but values do not rise. The output is very large. It is stated that in Lanarkshire alone 20,000 tons per week more are being put out than was the case very recently. Several coal companies have issued their annual reports, and all speak of losses. The Lothian Coal Company, who are owners of the Newbattle cannel, lost £10,000 by the strike of the miners last year. Another item they report is that the price of cannel is now £1 per ton lower than it was when at its highest. Splint coal is said to be very plentiful, and is being pressed on the market. Steam coal is in good request, and offers to continue so; the manufacturing industries being well employed. The prices quoted are: Main, 5s. 9d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s. 0d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 148,775 tons—a decrease, as compared with the preceding week, of 14,653 tons, but an increase as compared with the corresponding week of last year of 60,393 tons. For the year to date, the total shipments have amounted to 5,922,426 tons—an increase when compared with the corresponding period of last year of 1,963,880 tons.

The Water Supply of Perranporth and St. Agnes.—A movement is on foot for the formation of a Company to supply water to the Cornish villages of Perranporth and St. Agnes. It is said that the capital will be £9000, in £10 shares.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 869.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	24–25*	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	10	16–17*	..	4 8 3
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107–109	..	4 11 9
200,000	5	1 May	6½	Bombay, Limited	5	7¼–7¾	..	4 3 10
40,000	5	,,	6½	Do. New	4	5¼–5¾	..	4 10 3
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258	..	4 13 0
180,000	,,	,,	9	Do. New	100	207–212	+2	4 4 11
220,000	Stck.	27 Sept.	11	Brighton & Hove Original	100	227–232	+5	4 14 10
933,500	Stck.	29 Aug.	5	Bristol	100	125–130	..	3 16 11
320,000	20	27 Sept.	11½	British	20	54–55	–½	4 1 10
50,000	10	29 Aug.	11½	Bromley, Ordinary 10 p. c.	10	22½–23½	..	4 17 10
51,510	10	,,	8½	Do. 7 p. c.	10	18–19	..	4 9 5
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	8¼–9	–¼	4 8 11
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	102–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	31–33	..	5 0 0
550,000	Stck.	26 Oct.	13½	Commercial, Old Stock	100	313–318*	+13	4 4 11
165,000	,,	,,	10½	Do. New do.	100	232–237*	+9	4 8 7
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	278–283	–2	4 11 10
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	215–220	..	4 11 10
535,000	Stck.	29 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25½–26½	..	4 3 0
354,060	10	,,	11	Do. Partly paid	7½	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12½	Gaslight & Coke, A, Ordinary	100	293–297	–1	4 5 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	282–287	..	3 9 8
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	135–140	..	3 11 5
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	193–198	..	3 10 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	282–287	..	3 9 8
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	167–170	..	3 10 7
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	135–140	..	2 17 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	145–150	..	3 0 0
908,000	,,	,,	6	Do. 6 p. c. do.	100	202–207	..	2 17 11
3,800,000	Stck.	10 May	12	Imperial Continental	100	245–250	–2	4 16 0
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	6–6½	..	4 12 4
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p.c. Deb.	100	113–116	..	4 6 2
541,920	20	12 June	5	Monte Video, Limited	20	18–19	..	5 5 3
150,000	5	24 May	8	Oriental, Limited	5	7¼–7¾	..	5 3 2
60,000	5	12 Sept.	7	Ottoman, Limited	5	5–5½	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1¾–2¾	..	8 0 0
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	108–112	..	5 7 1
500,000	100	4 June	6	2nd Do.	100	102–107	..	5 12 1
150,000	10	16 Oct.	7	San Paulo, Limited	10	11–12*	–½	5 16 8
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	370–375	..	4 2 8
1,350,000	,,	,,	12	Do. B do.	100	308–313	–2	3 16 8
308,685	,,	,,	13	Do. C do.	100	325–330	..	3 18 9
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	175–178	..	2 16 2
60,000	Stck.	12 Sept.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	293–298	..	3 7 1
1,719,514	Stck.	16 Oct.	7	East London, Ordinary	100	223–228*	..	3 1 5
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	118–122	..	2 17 5
708,000	Stck.	29 Aug.	12	Kent	100	307–312	..	3 16 11
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	258–263	–2	2 17 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	208–213	..	3 10 5
330,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	143–148	..	2 13 4
500,000	100	14 Aug.	12½	New River, New Shares	100	385–395	..	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143–148	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	147–152	..	2 12 7
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	293–298	..	3 7 1

*Ex div

Sale of the Uffculme Gas-Works.—The Uffculme Gas-Works, until recently carried on by a company, have been sold to Mr. Ellis Curwood.

River Pollutions and Water Supplies in the West Riding.—The West Riding Rivers Board are very actively exercising the powers they possess in suppressing pollutions. They have undertaken several prosecutions of late, which have all proved successful; penalties having been inflicted, and orders made to abate the nuisances. At the last meeting of the Board, it was reported that, in the matter of pollution by domestic sewage, several authorities had been threatened with legal proceedings. Reference was also made to the "offensive state" of the River Don; and those causing the contamination of this river were, it was stated, to be served with notices. In the case of the Dearne—a tributary of the Don—a quantity of animal refuse, probably coming from a slaughter-house, and other matter had been deposited in the stream; and this was said to be "one example out of many instances" of the way in which this river was used. An important question had also been before one of the Committees relating to the water supply of Leeds; and they had ordered a report to be sent to the Corporation for their information. Regarding this point, it was remarked by Alderman Anderton that the question whether they should begin to deal with pollutions which really injured domestic water supplies was one they would have to put aside for the present. They seemed to have very much more serious pollutions to deal with before they could take up smaller pollutions affecting the purity of domestic water supply. While anxious to co-operate with large corporations in protecting their water supply, they thought, perhaps, that bodies like the Leeds Corporation would agree that it was within their own power to deal with this particular complaint. Anyhow, the Board were wishful to work in harmony with the Corporation; and they would suggest that, if they did not see their way to deal with the matter directly, then the Board would be glad to meet a deputation from the Corporation, and try to agree upon some joint action. The report was confirmed.

The Gas Supply of Brighouse and Rastrick.—The Gas Committee of the Brighouse Corporation appointed by the Act passed last session by which they acquired the plant of the Rastrick Gas Company, have already proposed a step likely to popularize the use of gas among inhabitants of the out-districts. The price charged for gas within the Brighouse portion of the borough at present is 2s. 6d. per 1000 cubic feet, or a price, deducting discount, equal to 2s. 4½d. In the Rastrick portion of the district, the price is, deducting discount, 2s. 10½d. per 1000 cubic feet. The Committee have decided that the price shall now be 2s. 11d. per 1000 cubic feet uniformly throughout the borough, with a 20 per cent. reduction on all accounts paid within two months. This works out at 2s. 4d. net, or a reduction of ½d. per 1000 cubic feet in Brighouse and 5¾d. in Rastrick.

The Position of the Shrewsbury Water Supply.—The ratepayers of Shrewsbury having decided adversely upon the proposed filtered river-water scheme (*ante*, p. 644), a number of gentlemen occupying professional positions in the borough have petitioned the Local Government Board to hold an official inquiry in order to put an end to the present deadlock. In their memorial, they detail the various abortive steps that have been taken by the Corporation with a view to improving the supply; and they fear that the constant strain upon the pumping machinery will result in a sudden collapse and, consequently, risk of water famine. The Local Government Board having sent a copy of the memorial to the Town Clerk (Mr. H. C. Clarke), requesting the observations of the Council upon it, it was brought before a recent special meeting of the members. After a full discussion, they instructed the Town Clerk to reply to the communication, and to state that the Council, without admitting all the allegations in the memorial, would gladly concur in such an inquiry as was suggested. At a later stage, the Council agreed to augment the supply of drinking water from the Weir Coppice springs, at a cost of £2000. It was also announced that, in consequence of the rejection of the river scheme, Mr. J. Cock has resigned the chairmanship of the Water Committee.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

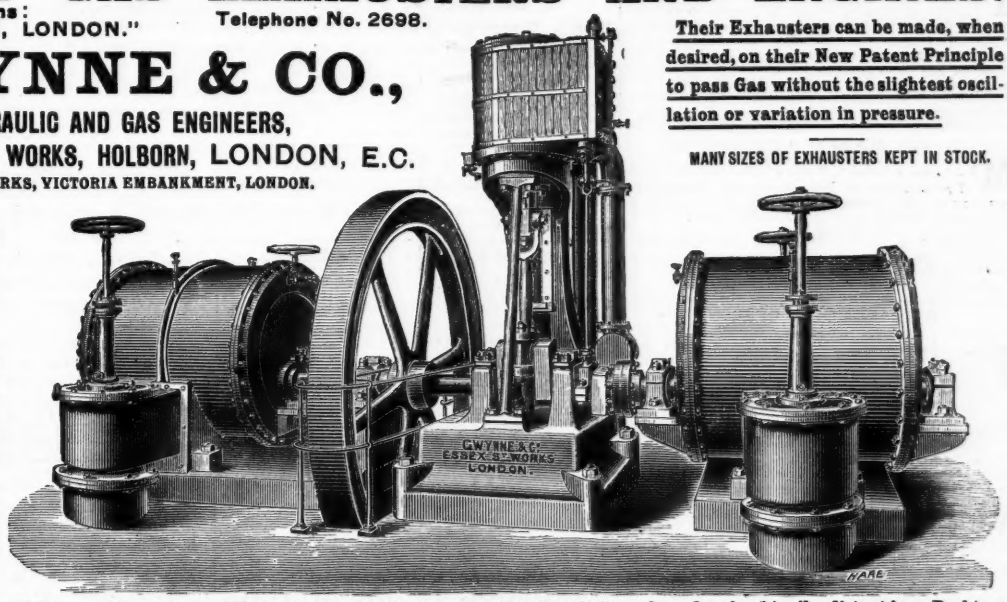
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works

ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "Volcanism, London."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.

*** See Advertisement p. 858 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.

Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.

Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

TO ENGINEERS AND MANAGERS.

MR. J. L. FEATHERSTONE (late Chief Draughtsman to Humphreys and Glasgow) is prepared to supply complete WORKING DRAWINGS, SPECIFICATIONS, and QUANTITIES for WATER-GAS PLANT. Own design.
Also DRAWINGS, TRACINGS, &c., of COAL GAS PLANT; Specially prepared for work wanted in a hurry. Moderate Charges.
Temporary Offices: 27, FORE STREET, E.C.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

WANTED, a Situation as Junior Gas-FITTER. Used to Iron and Compo. Fitting, aying Mains and Service-Pipes, &c.
For further Particulars, address No. 2577, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Manager (Gas and Water) desires RE-ENGAGEMENT. Ten years' experience. Thoroughly practical and economical Carbonizer. Excellent Testimonials.
Address No. 2579, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Working MANAGER in a small Gas-Works. Well acquainted with the Manufacture and Distribution of Coal Gas from the Retort to the Burner.
Address No. 2586, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG Man (age 25) wants a Situation as CHIEF CLERK or CLERK in a Gas or Water Company's Office. Would not object to go abroad. Ten years' experience in Gas-Works Office. Good references.
Address No. 2588, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser, with wide connection among Gas Managers throughout the United Kingdom, is open to take up a SPECIALITY on very favourable terms, either temporarily or permanently. Can offer London Office in good situation.
Projectors of new Carburettors, Retorts, Incandescent Lighting Apparatus, and other Novelties in Gas Plant and Gas Lighting are invited to correspond with No. 2572, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTER AND SERVICE LAYER.

WANTED, by a Suburban Gas Com-pany, a competent Man as above.
Apply, by letter, to No. 2585, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED,
MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 815, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office MIDDLESBROUGH. Correspondence invited

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

WANTED, at once, Two good Gas-FITTERS.
Apply to the NUNEATON GAS COMPANY.

GAS MANAGER WANTED.

THE Directors of the Carlow Gas Com-pany will, at their next Meeting on Friday, the 15th of November, at Eleven o'clock, receive APPLICATIONS from competent men, whose entire time will be required by the Company. Salary £80 per annum, with Residence, Fuel, and Light. Personal attendance will be required.
Apply to EAMES ROGERS, Secretary.

WANTED, a Second-hand Copy of KING'S TREATISE on COAL GAS. State price.
Address No. 2587, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF STOKE-UPON-TRENT.

TO IRONFOUNDERS.

THE Gas Committee of the Corporation invite TENDERS for the construction and erection of Two PURIFIERS, 25 ft. by 25 ft. by 5 ft., for their Gas-Works.
Drawings and Specifications can be seen on application to W. Prince, Engineer and Manager, Gas Offices, Wharf Street.
Sealed tenders are to be sent in, addressed to Councillor F. Geen, Chairman, Gas-Works, Stoke-upon-Trent, on or before Wednesday, the 13th day of November, 1895, endorsed on the outside "Tender for Purifiers."
The lowest or any tender not necessarily accepted.
By order,
J. B. ASHWELL,
Town Clerk.

Limp Cloth. Price 6d.
ARCHITECTS AND SURVEYORS'
HANDBOOK OF GAS-FITTING.
(TABLES AND RULES BY ARTHUR H. CRUMP.)
JAMES STOTT AND Co., 174, Fleet Street, LONDON, E.C.

Price 15s., Limp Cloth, the Fifteenth Yearly
ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,
Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1894, or March 31, 1895, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1894.
Compiled and arranged by
ALFRED LASS, F.C.A.
LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.
For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.
Prices are Reduced.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo,* **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others,* **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

The Subscription List will be opened on Thursday, 31st of October, at 10 a.m., and will be closed on or before 4 p.m. on the same day for London, and the following morning for the Country.

FRANK WRIGHT'S

PREPAYMENT GAS-METER CORPORATION, Ltd.

Incorporated under the Companies Acts, whereby the liability of the Members is limited to the amount of their Shares.

CAPITAL - - - - - £100,000,

In 100,000 Shares of £1 each,

Of which the Vendor takes 33,333 Shares in part payment of the Purchase-Money, being the largest amount permissible under the Rules of the London Stock Exchange, and the Balance of 66,667 Shares is now offered for Subscription.

Payable: 5s. upon Application; 5s. upon Allotment; 5s. one month after Allotment; and 5s. three months after Allotment.

Directors.

GEORGE RODDAM BURN, Esq., 6, Bell Yard, Doctors' Commons, E.C.; LORD HAY OF KINFAUNS, Dupplin Castle, Perth, N.B.; SAMUEL SPENCER, Esq., C.C. (of Messrs. J. E. & S. Spencer, Tube Manufacturers), Director of the Croydon Gas Company, 14, Great Saint Thomas Apostle, E.C.; T. ERNEST POLDEN, Esq., of Gale & Polden, Limited, London and Aldershot; *FRANK WRIGHT, Esq. (*Managing Director*), Sole Owner of Messrs. Alexander Wright & Co., Consulting Gas Engineers and Manufacturers.

*Will join after allotment.

Bankers.—Messrs. BROWN, JANSON, & CO., 32, Abchurch Lane, London, E.C.

Consulting Engineers.

SIR FREDERICK BRAMWELL, Bart., M.Inst.C.E.; H. GRAHAM HARRIS, Esq., M.Inst.C.E. (BRAMWELL & HARRIS, 5, Great George Street, S.W.

Patent Agents.—Messrs. ABEL & IMRAY, Chancery Lane, E.C. **Solicitors.**—Messrs. HURRELL & MAYO, 33, Cornhill, E.C.

Brokers.—Messrs. JAMES CALVERT & CO., 120, Bishopsgate Street Within, and Stock Exchange, London.

Auditors.—Messrs. J. F. LOVERING & CO., Chartered Accountants, Church Passage, Guildhall, E.C.

Secretary and Offices.—F. F. NORRIS, 5, Fenchurch Street, London, E.C.; 19 & 21, Old Queen Street, Westminster, S.W.

PROSPECTUS.

THIS Company has been formed for the purpose of acquiring, working, and selling or otherwise dealing with, the completed Patents and applications for Patents (or rights relating thereto) and the several future improvements thereon (as set forth in the contracts) of the Coin-freed or Prepayment Gas-Meters, invented by Mr. Frank Wright, for the United Kingdom and Colonies (Canada alone excepted).

The Company will also acquire certain other Patents, together with the rights relating thereto, and future improvements thereon for improvements in Gas-Meters, also the invention of Mr. Frank Wright, the object of which is to reduce the cost of their manufacture, and to render them more reliable as registers of the gas consumed than has hitherto been possible.

The following are the British Patents and Applications for Patents that will be acquired by the Company—viz., No. 3356 (1892) Improvements on Gas-Meters. No. 3266 (1895) Improvements in Coin-Freed Meters. No. 1325 (1895) Provisional Specification for Improvements in Coin-Freed Meters. No. 10,075 (1895) Provisional Specification for Improvements in Dry Gas-Meters.

The Company will further acquire any and every improvement, alteration, modification, or new invention that Mr. Wright may make, bearing upon, or in any way connected with, Gas-Meters or their substitutes or equivalents for the United Kingdom and Colonies (Canada alone excepted).

The best guarantee of the utility and practical character of the inventions to be acquired by the Company is the fact that the inventor is the only member of the well-known and old-established firm of Alexander Wright & Co., Gas Engineers, of Westminster. This firm is known throughout the Gas World as one of the first as consulting gas engineers and inventors and manufacturers of scientific gas-testing instruments used by most of the Gas Companies and Corporations.

The object of the Prepayment Gas-Meter is to enable the industrial classes and other consumers to avail themselves of the advantages of gas-lighting by paying for the gas in small quantities as they require it. By this arrangement, consumers will be enabled to pay for their supply of gas in advance. An important consideration in connection with a large class of users to which this invention specially appeals, is the supersession of the dangerous paraffin lamp, which causes so many fatal accidents.

To meet the requirements of large consumers, meters will be made to take coins of higher values, and to supply gas for a longer time. In fact, the supplying capacity of the meters will range from one penny upwards.

This Prepayment Meter differs from others of its class inasmuch as no gas can be consumed unless the coins are passed through the slot into the cash-tube; and as the gas is being consumed, the coins are slowly moved towards the cash-receiver, into which they fall directly the meter has given the quantity of gas equivalent to the value of the coin which the meter has been constructed to take. The amount of money found by the collector in the cash-receiver must agree with the register in front of the meter, thereby providing a double check upon the gas burned.

A most important feature in this meter is that it is self-acting; being worked by the pressure of the gas. There is no handle to manipulate, nor is there any other similar mechanical operation necessary to set it in action; it being claimed to be the only true Automatic Gas-Meter extant.

Another noteworthy point in regard to this meter is that the automatic prepayment mechanism is as easily applied to a wet meter as to a dry one.

The prepayment system strongly commends itself to Gas Companies as a means of obtaining an increased consumption at a minimum cost for collection of payments, combined with the certainty of making no bad debts. As a matter of fact, the leading Gas Companies have already introduced the Prepayment Meters in the districts supplied by them; being highly in favour of the system. Some of these Companies have decided, wherever the consumer will adopt a Prepayment Meter, instead of the ordinary meter now in general use, to supply one, and to abolish the deposit system, which is very unpopular; and the Directors anticipate that other companies will follow this example.

In the last report of a large London Gas Company, it is stated that the use of Automatic Meters has increased; and on the 30th of June last, there were no fewer than 32,333 then in use by that Company. It will, therefore, be readily realized that an immense field is open for a thoroughly reliable meter, especially having regard to the fact that the use of gas does not even now extend to half the possible number of consumers to be found in districts where gas is obtainable.

The supply of a thoroughly reliable and accurate Prepayment Gas-Meter has, in fact, become a matter of vital importance to every Gas Company and Corporation in the United Kingdom; and the Directors, after consulting some of the leading experts in gas supply, are of opinion that the Company's Meter will fully meet all the requirements of both Gas Companies and Consumers, being simple in construction, perfect in its action, accurate in registration of gas consumed, not easily tampered with, and with ordinary treatment not liable to get out of order.

An order for a large number of meters has been already received from The Gaslight and Coke Company, London; and many other Gas Companies and Corporations have already given sample orders for the meters.

From estimates which have been submitted to the Directors, they are of opinion that the Prepayment Meters can be manufactured at a price which will leave a sufficient profit on sales to pay a substantial dividend upon the Capital of the Company, after paying all expenses of every kind.

Premises in every way suitable for carrying on the business of the Company on an extensive scale have been secured in Trafalgar Road, Old Kent Road, at a moderate rental, with the option of purchasing the freehold at a reasonable fixed price, whenever the Directors may deem it advisable.

The plant and machinery erected at the works, together with the stock of raw material and meters in course of manufacture, both at Trafalgar Road and Mr. Wright's premises at Millbank Street, will be taken over by the Company at a valuation.

The services of Mr. Wright have been secured to the Company as Managing-Director for a period of five years.

Messrs. Bramwell & Harris, the well-known and eminent Consulting Engineers and experts, have examined the Specifications of the above Patents and the capabilities of the Meter; and a copy of their opinion accompanies the Prospectus.

Messrs. Abel & Imray, of Southampton Buildings, London, the well-known Patent Agents, have been consulted; and their opinion is that these Patents are good and valid.

The following is a copy of the opinion of the eminent Counsel who have been consulted with regard to the validity of Mr. Wright's patents:—

[COPY.]

Re FRANK WRIGHT'S PATENTS.

We have read and carefully considered the Specifications of Frank Wright, Nos. 1325 and 3266 of the year 1895, and also the following Specifications, bearing upon the subject of Automatic Gas-Meters:—

Price	15,410/87.
"	164/89.
"	11,185/93.
Stevens	9,643/94.

In our opinion, both the said Specifications of Frank Wright disclose good subject-matter for Letters Patent.

They are not anticipated by any of the Specifications mentioned, nor will the application of them amount to any infringement of any of the Letters Patent covering the inventions described in those Specifications; and in the absence of anything further in the way of anticipations, both the said Letters Patent of Frank Wright will be valid.

(Signed) J. FLETCHER MOULTON, Q.C.
THOS. TERRELL, Q.C.
ARTHUR J. WALTER.

Temple, 9/10/95.

The price to be paid to the Vendor for the Patents and Rights to be acquired by the Company is £60,000, payable as to £26,667 in cash, the balance in fully paid-up Shares in the Company.

The following Contracts have been entered into, viz.:—

(1) Between Frank Wright of the one part and this Company of the other part, dated 24th day of October, 1895.

(2) An Agreement between the Company of the one part and Frank Wright of the other part as to services, dated 24th day of October, 1895.

(3) An Indenture made between Frank Wright of the one part and G. H. Adams of the other part, and dated 24th day of October, 1895.

These Agreements, the Memorandum and Articles of Association, and the opinions of Messrs. Abel and Imray, can be inspected at the Office of the Solicitors to the Company.

No promotion expenses have been, or will be, paid by the Company.

Applications for Shares must be made upon the form annexed to the Prospectus, and be accompanied by a remittance of Five Shillings per Share; and in cases where the number of Shares allotted is less than the number applied for, the surplus amount paid on deposit will be credited towards the amount payable on allotment. Where no allotment is made, the deposit will be returned in full.

Application will be made in due course for a quotation for the Shares upon the London Stock Exchange.

Prospectuses and Forms of Application for Shares may be obtained at the Offices of the Company, and at the Bankers, Brokers, and Solicitors.

25th October, 1895.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 31, OLD BROAD ST., E.C.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

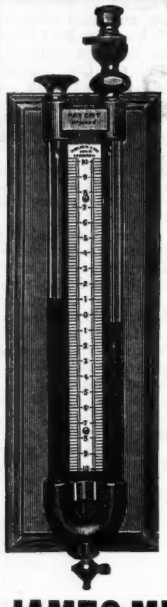
DALKEITH, N.B.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.

IRONFOUNDERS,

MIDDLESBROUGH.



MILNE'S PATENT HANDY PRESSURE-GAUGE.

By merely slackening a screw at the base, the Gauge can be taken to pieces. Can be jointed with either Asbestos, Leather, or Rubber.

JAMES MILNE & SON, LTD.,

EDINBURGH, & LEEDS,

LONDON, & GLASGOW.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
Ash . . . . . 2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON, FITTER.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

Contractors for the erection of Retort-Benches complete.

London Agents:

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

ECONOMIZE £16 per RETORT per ANNUM by the USE of RETORTS of REDUCED THICKNESS fitted with

GUEGUEN'S COMPENSATING HELICOIDAL RIBS.

NO OUTLAY OF CAPITAL.
NO ALTERATION IN SETTINGS.
APPLICABLE TO ALL RETORTS.

J. LANS,
Engineer,
10, MOORGATE STREET,
LONDON, E.C.

Inquiries from Retort Makers will be Esteemed.

A FREE TRIAL FOR ALL.
Agents Wanted.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

In One Vol., Royal 8vo., 32s. Cloth; Net Cash, Post Free, 26s. 6d.

MICHAEL AND WILL ON GAS AND WATER.
The Law of Gas, Water, and Electric Lighting—*Fourth Edition*—re-written and brought down to date by J. SHIRESS WILL, Q.C.

LONDON: BUTTERWORTH & CO., 7, FLEET STREET.

KENT'S THICK GAS COAL
RAISED AT
The Wharncliffe Woodmoor Colliery,
BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.
Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to the
Wharncliffe Woodmoor Colliery Co LIMITED,
BARNSLEY;
Or to Mr. W. H. HARVEY,
17, Old Queen Street, Westminster, S.W.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

W. E. SANDER,
COMMISSION AGENT, BERLIN, 41, FRIEDRICH STR.

SPECIALITIES: Incandescent Lamp Burners and Mantles (with or without electric lighting from any distance, by button from the wall, etc.).

INCANDESCENT SPIRIT LAMPS.
Electro-technical Ware of all kinds.
IMPORT and EXPORT.

OIL GAS

BETTER TERMS CAN BE OBTAINED FROM SUPPLIERS OF OIL IF PURCHASERS HAVE THEIR OWN
TANK-WAGGONS.

HURST, NELSON, & Co., LTD.,
THE GLASGOW ROLLING STOCK AND PLANT WORKS, MOTHERWELL.
REGISTERED OFFICE:
27, ST. VINCENT PLACE, GLASGOW.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

Telegraphic Address: "Robustness, London." Telephone No. 1756.

J. & H. ROBUS,

ENGINEERS & CONTRACTORS FOR GAS & WATER WORKS,

20, Bucklersbury, London, E.C.

RETORT-SETTING & Gaseous Firing a Speciality.

MAIN LAYING,

AND THE ERECTION OF GAS AND WATER PLANT OF EVERY DESCRIPTION,

INCLUDING SINKING WELLS AND BOREHOLES.

GASHOLDER TANKS.

Established 20 Years.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

Abercorn Foundry and Abbey Works,

PAISLEY, N.B.,

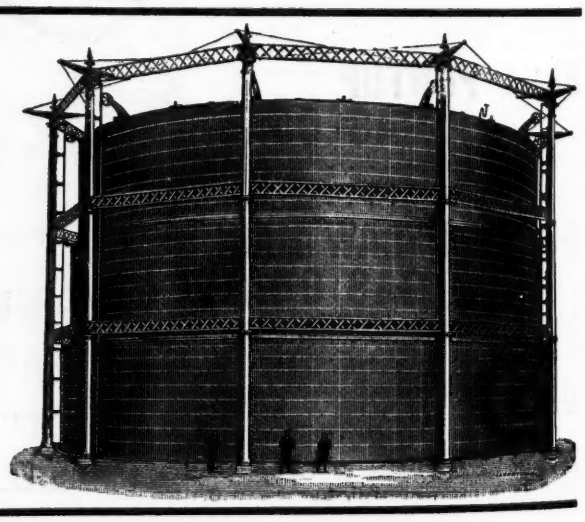
MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald Paisley."



D. HULETT & CO., LTD.

55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.

LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

PRICE LISTS ON APPLICATION.

WILLEY & CO.,

GAS ENGINEERING CONTRACTORS,

EXETER,

For **GASHOLDERS** and all kinds of **ENGINEERING APPARATUS.**

For **WET** and **DRY GAS CONSUMERS' METERS.**

For **COIN METERS,** their Patent Automatic is admitted to be one of the best and most reliable in the Market. Largely used in the Metropolis.

For **GAS-FITTINGS,** Registered Designs in Extensive Variety.

Manufacturers of the **LIVESEY WASHER.**

Agents for the **MAXIM CARBURETTOR.**

New Works, 5 acres in extent, recently opened in the City of Exeter for the Manufacture of every kind of Apparatus used in the Production, Distribution, and Sale of Gas.

Telephone 132. Telegraphic Address: "Willey, Exeter."

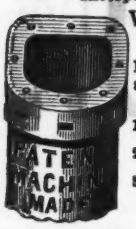
ESTABLISHED 30 YEARS.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,



Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE MARK.	TELEGRAMS:	LONDON OFFICE:
CXC	"JACKSON"	12, BURWOOD PLACE, W.
	CLAY CROSS.	

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: 22, TEMPLE ST., BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN BIRMINGHAM." Telephone No. 200.
London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "PARKER LONDON."

GASEOUS FIRING A SPECIALTY.

Telegraphic Address: "DRAKESON, HALIFAX."

Telephone No. 43. HALIFAX EXCHANGE.

GAS ENGINEERS.
RETORT SETTERS.
IRONFOUNDERS.

SOLE MAKERS OF
"MITTON'S"
PATENT SELF
-SEALING-
RETORT-LID.

JONAS DRAKE & SON.
—SOLE AGENTS—
For
"HISLOP'S"
PATENT REGENERATIVE
— FURNACES. —
FOR ENGLAND, WALES & ABROAD.
OVENDEN, HALIFAX.

CONTRACTORS.
FURNACE BUILDERS.
&c. &c.

SOLE MAKERS OF
"SETTLE'S"
PATENT COMBINED
SEAL-REGULATING
FLUSH-VALVE.

London Office:
60. QUEEN VICTORIA ST., E.C.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

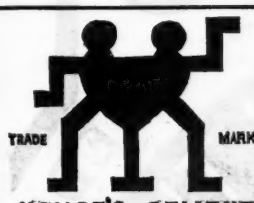
Copenhagen	700,000 Cub. Ft.	Brussels	700,000 Cub. Ft.
Belfast	1,700,000 „	Liverpool	2,500,000 „
Glasgow	300,000 „	Tottenham	600,000 „
Santiago	400,000 „	Brighton	1,250,000 „

And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Manchester	3,000,000 Cub. Ft.
Swansea	700,000 „	Bath	1,000,000 „
Preston	1,500,000 „	New York	1,000,000 „
Southport	750,000 „	Newburgh	350,000 „

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. Telegrams: "EPISTOLARY, LONDON." *United States Office, 64, Broadway, New York.*



HOUSE'S CEMENT

USED BY 350 GAS-WORKS.
HOUSE'S For High Pressures, Cylinder Covers, Steam, Gas, and Water Socket and Flange Manholes.
A Month's free trial.
JOINTING CEMENT
1 cwt. equals 3 cwt. of RED LEAD.
& TANNIC COMPANY, LTD.,

The Ancient Philosophers thought and Cudgelled their Brains with
WHAT IS HOUSE'S TANNIC COMPO. "LO."?
It will pay you to inquire when you want your Boilers cleaned and you suffer with incrustation.
NO CURE. NO PAY.
A Free Trial to Engineers, Gas Companies, and all Steam Users.
NORTH WORKS, RIPON.

A SCIENTIFIC INVENTION.
ABOUT Not made by Rule of Thumb.
HOUSE'S Better Power and goes farthest,
Free from Resin. BELT Cheapest and Best.
Send for Circular and Particulars for Black Belts.
DRESSING
1 Gallon does the same Work as 56 lbs. of other mixtures.
LONDON AGENTS:
Bale & Co., 120, Newgate Street, E.C.

TANKS ROOFS

CUTLERS PATENT TUBULAR GAS CONDENSER SUITABLE FOR GASWORKS OF ALL SIZES, AND FOR ANY CLIMATE OVER 100 ERECTED

MAKERS OF GASHOLDERS OF EVERY SIZE AND TYPE

HUNT'S PATENT WASHER. IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS. IT REQUIRES NO MOTIVE POWER

TELEGRAMS "RETORTUS" LONDON

NATIONAL TELEPHONE 5059.

S. CUTLER & SONS, MILLWALL LONDON

FOREIGN AGENTS COLONIAL AGENTS

A SPECIALTY STEEL TANKS FOR GASHOLDERS AND OIL STORAGE.

IMPROVED SYSTEM OF CARBURETTED WATER-GAS PLANT PARTICULARS ON APPLICATION.

CUTLER'S FREEZING PREVENTER IS THE BEST APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA.

ELECTRIC FITTINGS DYNAMOS MOTORS.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES.

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to

THOMAS BUGDEN, Manufacturer,

71, GOSWELL ROAD, LONDON, E.C.

CLAYTON SON & Co LTD

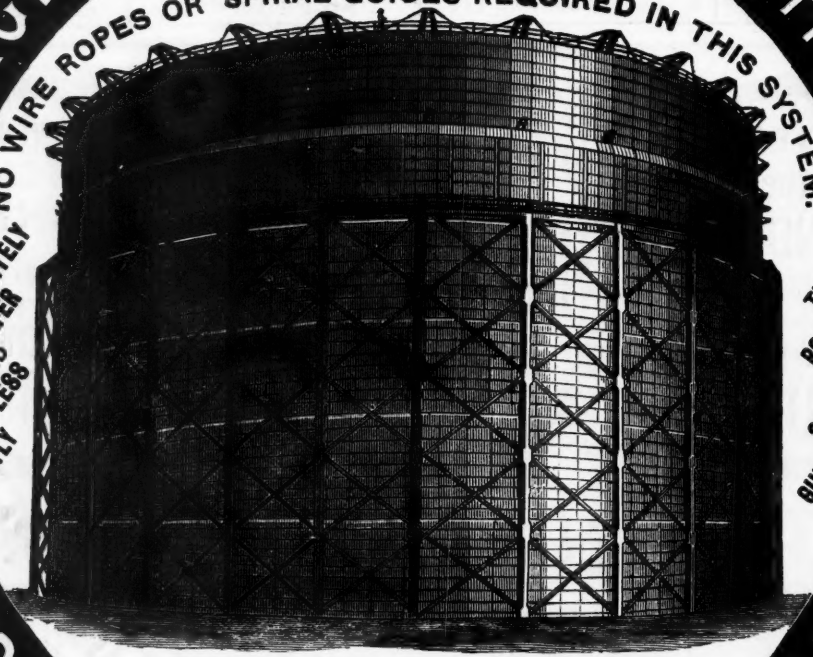
MAKERS OF

WORKS LEEDS

THE LARGEST GASHOLDER IN THE WORLD.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.

TELEGRAPHIC "GAS, LEEDS."

GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

STOURBRIDGE
RETORTS AND FIRE-BRICKS.
BEST QUALITY.
KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, Oct. 1, p. 697.]

HARPER & MOORES,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1838.

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

ESTABLISHED 1861.
JOHN BROTHERTON, LIMITED,
IMPERIAL TUBE WORKS,
WOLVERHAMPTON,
MAKERS OF
TUBES AND FITTINGS
FOR EVERY PURPOSE.
PLEASE APPLY FOR LISTS. Telegrams: "IMPERIAL, WOLVERHAMPTON."

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING
GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Oct. 1, p. 695.]

BEST & LLOYD
MAKERS OF BIRMINGHAM.
THE
PATENT "SURPRISE"
PENDANT,
WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.
"IN CONJUNCTION WITH
THE INCANDESCENT GAS-LIGHT,
it quite supersedes the familiar three-light pendant. We are able to bear witness to the convenience of the New Pendant."

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.
LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.
MACHINE-MADE RETORTS
Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.
RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

SERVICE CLEANER.

HUTCHINSON BROTHERS,

GAS ENGINEERS, &c.,

MANUFACTURERS OF IMPROVED

WET AND DRY GAS-METERS.

STATION-METERS. LAMP-METERS.

TEST GASHOLDERS & GENERAL GAS APPARATUS.

BRASS MAIN AND LAMP TAPS.

UNIONS, FERRULES, ETC.

The "Falcon" Lamplighter's Torch. Service Cleaners.

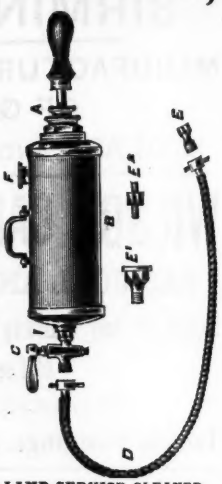
SYPHON AND OTHER PUMPS.

Wood and Wrought-Iron Purifier-Grids. Scrubber Boards

WET AND DRY METERS REPAIRED.

FALCON WORKS, BARNSLEY.

Telegrams: "HUTCHINSON BROS., BARNSLEY."



LAMP SERVICE CLEANER.

CLAPHAM BROTHERS, LIMITED,

— ESTABLISHED 1837 —

LARGE REPEAT ORDERS

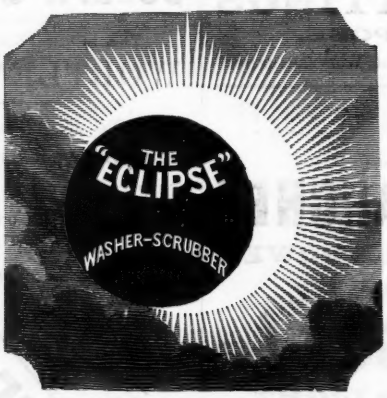
Have been received for

Laycock & Clapham's Patent

"ECLIPSE"

WASHER-SCRUBBERS.

Order Early.



GREAT SUCCESS

OF

Clapham's Patent

"ECLIPSE"

CONDENSER.

SEND FOR PARTICULARS.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS, MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

Catalogues, New Book of Testimonials, and full Particulars on Application.

Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 29, 1895.